ROADS and STREETS

Vol. 81, No. 8 August, 1938

A GILLETTE PUBLICATION
ESTABLISHED 1906

At Ryan Sons' Borrow Pit

RECONSTRUCTION OF U. S. 51 between JANESVILLE and BELOIT, WIS.

By JOHN C. BLACK

Field Editor, Roads and Streets

I DROVE up to Beloit and Janesville, Wisconsin, late in July to have a look at the grading jobs which J. R. Griffith Company of Racine and P. W. Ryan Sons of Janesville were completing between the two cities. They weren't spectacular jobs but they carried a fair proportion of interesting features and practical suggestions. Concrete should be going in before the August issue of ROADS AND STREETS is off the press, and if circumstances permit, we shall have an account of it in September or October.

The work involves the tearing out of 8¾ miles of old 20-ft. concrete, moderate grade raising over long stretches, change of alignment at some points, and the laying of a new 30-ft. slab. For 3½ miles north of the Beloit city limits, there is also a concrete sidewalk, laid on an easement adjoining the right-of-way. The northerly end of the 13 miles betwen Beloit and Janesville is already provided with a good 3-lane pavement, in which no changes are being made.

The new right-of-way is 100 ft. wide, the necessary increase in width for a considerable part of the distance, having been secured from an abandoned interurban line which adjoined the old highway. Ultimately it is expected that a fourth lane of concrete will be installed over the entire 13 miles.

Grade raising is as important a feature of the improvement as increased width, for the old road had numerous spots which were subject to flooding sufficient

This 7-Yard Continental Scraper Is Trimming a Side Slope of the Old Road. The Operator on the Allis-Chalmers Gas Tractor Was Speedy in Making the Large Number of Backs and Fills Necessary to Secure a Full Load with Short, Shallow Cuts. This Was on the J. R. Griffith Contract.

Trees Standing in the Way of Side Slopes Are Protected by Dry-Laid Walls of Old Concrete Whether in Cut or Fill

to stop traffic. The most important alignment change replaces a bad combination of sharp curve and dip with a good easy curve at high level, and also saves considerable distance.

Grading Operations

I was told that the old pavement varied considerably in quality, thickness and condition, much of it having been very good when the present job was started, while other parts were poor. It was unreinforced, and appeared to average between 8 and 10 in. thick. The contractor had broken it with a 2½-ton ball, dropped 5 or 6 ft. on spacings of about 3 ft. in each direction. Breakage was so thorough that it was not only easy to excavate, load and haul, but was suitable for wall construction around trees and for other uses. The foreman told me that they broke an average of 1,800 ft. of the 20-ft. pavement in 8 hours.

All borrowed material for fills was local sand and gravel ideal for the purpose. It was spread in layers and compacted by the ordinary operation of the construction equipment, without any special rolling or tamping. No stabilizing element of any sort was added. Shoulders will be of this same gravel, untreated for the present.

Sidewalk Construction

The Griffith Company has the first 4¾ miles out of Beloit, and in addition to grading and paving, has the contract for the 3½ miles of sidewalk. As previously mentioned, this walk is on an easement adjoining the

Caterpillar and 9-Yard Le Tourneau Cleaning Up on Griffith's Job

J. R. Griffith's 1¼-Yard Koehring Shovel Excavating Old Concrete Which Was Cracked with 2½-Ton Ball

right-of-way. Much of it is on a fill, and as shown in the pictures, is separated from the roadway by a wide, shallow ditch.

To enable the concrete trucks to reach sidewalk level, the contractor provided a portable ramp, consisting of four 3x12-in. planks, 16 ft. long, joined by square and diagonal braces. When time to move, four men simply pick it up and carry it, but it takes four husky ones. The picture shows the blocking at the third points, and also the patches of gravel shovelled in at the toe to enable the truck to run smoothly onto the planks without having to climb the ends.

The walk is 4 ft. wide and 5 in. thick. After the grade is finished and the 2-in. wooden forms set, a ½-in. to 1-in. sand cushion is spread and tamped by hand. It is sprinkled lightly by hand before tamping. A ½-in. bituminous felt joint is provided every 30 ft. Concrete is given an ordinary belt finish, with tooled edges and a panel marked off every 5 ft.

All concrete is delivered in 1½-yard truck-mounted mixers from the Consumers' Company plant at South Beloit, the average haul being about 4½ miles. About 40 minutes is required for a round trip. The sidewalk gang consists of a foreman, 2 finishers and 4 laborers.

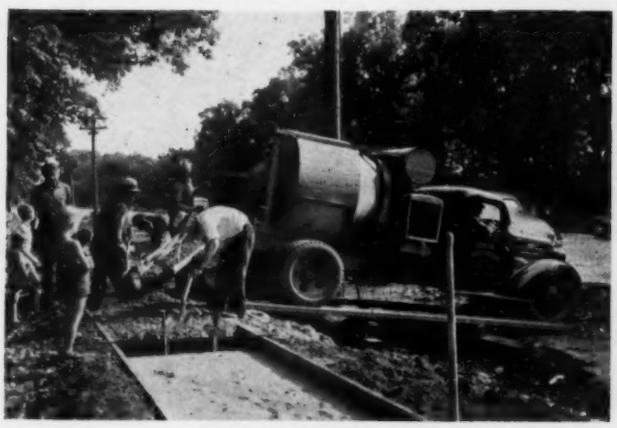
Drainage

Drainage under the walk is provided at frequent intervals by 18-in. Republic Steel, U-LOY corrugated cul-

At One of the Larger Culverts on the Griffith Contract. Loose Earth Which Has Been Dumped on Top of the Box Is Shoveled Off to Help Fill Voids in the Fill of Broken Concrete at the Sides. The Allis-Chalmers Tractor with Bulldozer Not Only Spreads the Heavy Material, But Is Run Back and Forth to Compact and Consolidate the Whole, as There Is No Regular Construction Traffic to Compact the Fill at This Point.

Sidewalk Construction. From Front to Rear: Forms with Sand Bed in Place, Bituminous Felt Joint in Place, Tamping Sand Bed (the Darker Color Indicates Freshly Sprinkled Sand), Concrete in Place and Struck Off, Belting Concrete, Paper Cover Unrolled on Concrete in Far Distance. In Right Foreground Is the Upper End of the Truck Ramp.

Ramp Ready for Concrete Truck. Note Intermediate Blocking and the Gravel Patches at Foot to Ease Truck Onto Ramp. Discharge End of One of the 18-Inch Culverts Is Visible at Right.



Rex Moto-Mixer on Ramp Discharging Concrete to Sidewalk

Train of Three Allis-Chalmers Tractors with Continental 7-Yard Wagon Scrapers Moving Earth for Ryan. Grader Trimming Up in Left of Picture.

General View of Aggregate Plant. The crushing, Screening and Washing Units Are from Lippmann Engineering Works. The Digging Crane Is a Koehring

Ryan Sons' Austin-Western 12-Yard Hydraulic Pulled by Caterpillar RD8

verts. Concrete box culverts of various dimensions under the roadway will care for the large amounts of water which will be discharged into the ditch on the upper side. Drainage on the opposite (the West side) is directly to the Rock River.

More Grading

P. W. Ryan Sons have the grading contract on the 4 miles from the end of the Griffith job to the connection with the existing 30-ft. pavement near Janesville. James Cape, of Racine, will lay the slab. Ryan's work includes a long fill totalling 62,800 yards, borrow for which is obtained from a pit of excellent gravel about one-half mile away. They excavate with a 2-yard Marion shovel and haul with three 4-yd. Koehring Dumptors, six 4-yd.

A Koehring Dumptor Has Just Dumped on Ryan's Long Fill.

trucks, and two 6-yard trucks. They keep a good hauling surface at the pit and along the road by frequent blading with an old Caterpillar grader pulled by an Allis-Chalmers K. So far, the best 8 hours shovel operation has been 1568 swings, with a full load practically every time, which is better than 3,000 yards for the day.

Where they had considerable grading on the road, the Ryans were using three 7-yard Continental scrapers pulled by Allis-Chalmers tractors, and one 12-yard Austin-Western hydraulic, with Caterpillar tractor.

The Gravel Plant and Its Water Supply

Production of concrete aggregate was started the very day I called, but in spite of the brief period of operation the plant was running smoothly. It is a Lippmann Engineering Works outfit, with a Koehring crane and clamshell doing the digging. Two Butler bins were on the job awaiting erection. Enormous quantities of gravel were taken from this pit in previous operations, but hundreds of thousands of yards still remain.

The most interesting feature of the installation is the wash water supply, which is obtained from 14 well points driven about 20 ft. below the bottom of a large pit, a hundred yards or so from the plant. The well pipes were of 2-in. diameter, connected to a 5-in. main, and the pump operator said were supplying about 700 gallons per minute.

A Small Box Culvert on the Ryan Contract.

Two Views of the Very Interesting Water Supply for Aggregate Plant. The 14 Well Points Yield About 700 Gallons Per Minute to the C. H. & E. Pump Powered by Le Roi Engine.

Old Equipment

All the equipment on both contracts had seen previous service—some of it, much service—but all was operating with apparent efficiency. Foremen for the contractors and inspectors for the state seemed pleased with results.

Highway Sidewalks

A progress report on the construction of sidewalks alongside highways was issued early last month by George C. Warren, Cambridge, Mass, chairman of the Highway Sidewalk Committee of the American Public Works Association. The following is taken from the report:

Massachusetts—Following New Jersey, which in 1921 passed a legislative act looking toward constructive activity, in 1935 Massachusetts was the first to actually begin highway construction on a large scale. At the close of the year 1937 Massachusetts had constructed 500 miles of modern high-grade highway sidewalks.

New York State—In 1937 New York State passed a very broad act looking toward extensive sidewalk construction in connection with its roadway development.

Other States report legislative progress in varying status of consummation.

International Association of Road Congresses—Report of the Eighth Congress, now being convened at The Hague, Holland, contains the following:

"Experience shows that pedestrians are responsible for the bulk of road accidents. It is therefore an obvious precaution of primary importance to construct sidewalks with a smooth and sufficiently hardened surface on all road sections having a pedestrian traffic of any importance. In many cases this is quite possible without incurring prohibitive costs.

"Like footpaths, cycle tracks should have a hardened surface not in any way inferior to the surfacing of the carriageway, as otherwise pedal cyclists will be tempted to leave the cycle track for the roadway. The cycle track should be separated as effectively as possible from the roadway, for the cyclist will not be safe from interference by other traffic unless this is done. The use of white lines to form traffic lanes is to be deprecated as being an inadequate substitute."

▼

Highway Sidewalks Reduce Pedestrian Accidents in Massachusetts

The construction of sidewalks along state highways in Massachusetts has effected a marked reduction in pedestrian injuries and deaths. A state wide program of construction has been completed by the State Department of Public Works. The program provided for 500 miles of sidewalk along the state highway system of 1,890 miles. A state appropriation was made available for the work. The purposes of this undertaking were to reduce accidents to pedestrians, provide employment, and indirectly to increase the value of abutting property. After the program was under way property owners offered easements for sidewalks without compensation. The locations for sidewalk construction were based on a 6-year study of collisions between pedestrians and motor vehicles in the state from 1930 through 1935. For that period the study showed a total of 4,427 accidents of the above class in which 3,841 persons were injured and 586 killed.

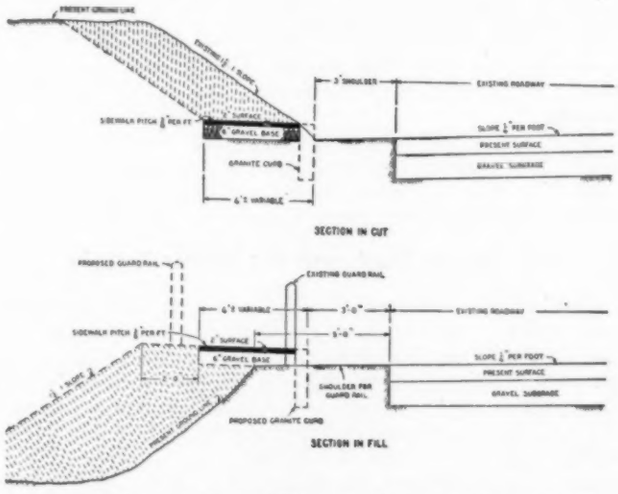
Before the program of construction began in 1935 there was a progressive increase in the accident rate as well as a general increase in pedestrian accidents in rural counties as against a decrease in the larger cities. In his report on the "Segregation of Various Classes of Traffic on the Highway," present at the recent 8th International Road Congress at The Hague, R. E. Toms, Chief Division of Design, U. S. Bureau of Public Roads, gives the same interesting information regarding the effect of this sidewalk construction on pedestrian accidents.

A table of pedestrian accidents on routes where sidewalks were constructed gives a comparison of pedestrian injuries and deaths for the first 6 months of each year since 1933.

PEDESTRIAN INJURIES AND DEATHS ON ROUTES WHERE SIDEWALKS WERE CONSTRUCTED

First 6 months of—	Injuries	Deaths
1934	240	21
1935	243	26
1936	212	24
1937	154	18

Records for the first 6 months of 1935, which was the period before the sidewalk program started, and the first 6 months of 1937, when the major part of the work had been completed, clearly indicate a decrease in pedestrian casualties.



Cross Sections of Typical Sidewalk Designs in Cut and Fill Used in Massachusetts

Despite an increase during this period of 12 per cent in registrations and 15 per cent in gasoline consumption, the number of pedestrians injured on these state highway routes decreased over 36 per cent, whereas total pedestrian accidents on all Massachusetts roads for the same period decreased only 11 per cent.

Reductions in pedestrian fatalities on state highways are consistent with those in injury cases. On state highway routes where sidewalks were constructed, the pedestrian fatalities in the same 6-month periods showed a reduction from 26 to 18, or about 31 per cent. This decrease is most significant when one considers that in the same period pedestrian fatalities in the state as a whole increased from 188 to 201, or about 6.9 per cent.

The above figures are for all types of pedestrian accidents. Studies of accidents involving pedestrians walking along the highway show a general reduction of over 50 per cent, and on many routes where sidewalks have been built, no accidents of this type have been recorded during the first 6 months of 1937, where formerly there were many serious casualties annually.

All new projects for the construction or reconstruction of state highways in Massachusetts now include the construction of sidewalks as an integral part of the design, except in unsettled areas where pedestrian movements are negligible.

CONTRACTORS OF WISCONSIN REGULATED BY CODE

Administrative Procedure and Development of Estimate Schedules Explained

By H. G. MEIGS

Manager, Wisconsin Associated Contractors

This subject applied to the highway construction industry is a lengthy one and I am not going to attempt to go into all of the details. I have covered, in a skeleton way, the plan of operation of the Trade Practice Department of Wisconsin as applied to the Highway Construction Industry. — The Author.

THE highway construction industry in Wisconsin became interested in fair trade practices in 1933 and the first code was enacted by the Legislature that year. It was patterned very much after the N. R. A. Contests arose under this law and our Supreme Court declared it illegal. The Legislature of 1935 enacted a new law, taking into consideration the decisions of the Supreme Court on the points which were declared illegal in the 1933 Act. The application of this Act to the highway construction industry became operative in August, 1935. Three decisions of our Supreme Court have declared this law constitutional.

Development of Estimate Schedules. There being no precedent or outline to follow in applying the law to the highway construction industry, we set out first to develop estimate sheets for the five divisions of the industry; namely, concrete paving, bituminous paving, bridges and structures, crushed stone and gravel surfacing, and grading.

The cost factors in these estimate sheets were secured from the experience of contractors. Cost and production schedules were developed that would apply to the average rank and file of contractors, based on their own experience. After these estimate sheets had been completed by the contractors, they were submitted to the Trade Practice Department for its approval. After the approval had been secured, the estimate sheets became effective as a part of the code.

The estimate sheets included all items of cost entering into the construction of a highway project, which included an hourly ownership and operating cost for each piece of equipment and labor costs per hour, broken down into the different subdivisions and classifications of the workers, and capacity and operation schedules.

Under the original plan, protests for violations of the standards were instituted by these examiners and heard before the code authority. In case of conviction by the code authority, the transcript of the testimony and the conclusions of the code authority were transmitted to the highway commission which, in most instances, rejected the bid of the violating contractor and readvertised the project.

It is hardly necessary to say that the first efforts were very crude and have been revised from time to time and will perhaps continue to be revised as we find corrections and changes necessary.

Setting Up Administrative Procedure. The administration of the highway construction industry under the act was originally in the hands of a Code Authority composed of thirteen members, eleven of which were contractors, one representing labor, and one representing the public. This committee was appointed by the Governor, who administers all the codes under the provisions of the act.

The Trade Practice Department appointed a deputy commissioner for the industry who, with the code authority, conducted all of the activities. These activities included the levying and collection of an assessment of ½ of 1 per cent of the amount of the contract to cover the cost of administration.

The code authority appointed two examiners who were carefully selected and who are very important factors in the administration of the work. One of these examiners was formerly a state highway commissioner and, prior to that time, the auditor for the state highway department. The other is a civil engineer of very high standing, having occupied the position of construction engineer for the state highway department and, prior to that, division engineer for the department.

This procedure did not receive the favorable approval of the U. S. Bureau of Public Roads and was changed to the plan of operation that is in effect today. It might be stated that the legislative Act of 1935 terminated on July 25, 1937. Because of an early adjournment of that legislature, the code became inoperative on that date and the special session of the legislature in 1937 re-enacted the Trade Practice Act known as Chapter 110, under which we are now operating.

This last law and the code that became effective under it, was signed by the Governor on January 12, 1938.

Under Chapter 110 of the Laws of Wisconsin the administration of the code, as I have stated, is directly under the Executive Office. The Governor created a trade practice department and appointed Senator Rowlands as Trade Practice Commissioner. The Governor conferred all the powers of the law upon the Commissioner.

Control. Under the provisions of the standards

that are now effective, difficulties and obstacles encountered under the original code were terminated and corrected as far as possible. The old estimate sheets were corrected and adapted to apply to the present law, and instead of protests being tried before a code authority body, protests are now being tried before the trade practice commissioner, and in cases of conviction the contractor is penalized under the provisions of the "Regulations Covering the Classification and Rating of Contractors" of the state highway commission of Wisconsin, commonly known as the prequalification provisions.

These prequalification provisions rate each contractor according to his financial status, as well as his experience as a contractor and his equipment, limiting the amount of work that he can have on hand at any one time and providing for penalties for the "violation of any state or federal law or regulation, or the rule or regulation of a federal department, board, or bureau, of a state department, board, or commission." Where the contractor is convicted of a violation of the standards of the highway construction industry, he is penalized under the regulations covering classification and rating. In other words, if a contractor is found guilty by the commissioner, he may be eliminted completely from further bidding for such a time as the state highway commission may determine.

The trade practice standards establish violations declared to be unfair trade practices and unfair meth-

1938

STATE OF WISCONSIN

TRADE PRACTICE DEPARTMENT
HIGHWAY CONSTRUCTION INDUSTRY

GRADING

Maximum and minimum productions provided in these standards were fixed by the Trade Practice Department after formal hearings. Where maximum production is mentioned it means that you can not exceed this amount in determining your costs. Where minimum production is mentioned it means that this is the least amount that can be used in determining your costs.

MAXIMUM PRODUCTION SCHEDULE FOR POWER SHOVELS IN YARDS PER HOUR FOR LOADING HAULING UNITS

Size of Dipper	Sandy Clay or Loam	Sandy Soil	Heavy Clay or Clay with Gravel	Gravel
	(1)	(2)	(3)	(4)
⅜ yd.	37	32	26	30
½ yd.	50	45	37	42
¾ yd.	75	67	56	64
1 yd.	100	90	75	85
1¼ yd.	125	112	94	106
1½ yd.	150	135	112	127
1¾ yd.	175	157	131	149
2 yd.	200	180	150	170
When Earth or Borrow Contains:				
5% Loose Rock..... ½ yd.	48	43	35	40
10% Loose Rock..... ½ yd.	45	40	33	38
25% Loose Rock..... ½ yd.	38	34	28	32
50% Loose Rock..... ½ yd.	25	23	19	21
5% Loose Rock..... ¾ yd.	71	64	53	61
10% Loose Rock..... ¾ yd.	67	60	50	58
25% Loose Rock..... ¾ yd.	56	50	42	48
50% Loose Rock..... ¾ yd.	38	34	28	32
5% Loose Rock..... 1 yd.	95	85	71	81
10% Loose Rock..... 1 yd.	90	81	68	77
25% Loose Rock..... 1 yd.	75	68	56	64
50% Loose Rock..... 1 yd.	50	45	37	42
5% Loose Rock.....1¼ yd.	119	106	89	100
10% Loose Rock.....1¼ yd.	113	102	85	96
25% Loose Rock.....1¼ yd.	94	84	71	80
50% Loose Rock.....1¼ yd.	62	56	47	53
5% Loose Rock.....1½ yd.	142	128	105	121
10% Loose Rock.....1½ yd.	135	122	101	114
25% Loose Rock.....1½ yd.	113	101	84	95
50% Loose Rock.....1½ yd.	75	67	56	64
5% Loose Rock.....1¾ yd.	166	149	124	142
10% Loose Rock.....1¾ yd.	158	141	118	134
25% Loose Rock.....1¾ yd.	131	118	98	112
50% Loose Rock.....1¾ yd.	87	78	65	75
5% Loose Rock..... 2 yd.	190	171	142	162
10% Loose Rock..... 2 yd.	180	162	135	153
25% Loose Rock..... 2 yd.	150	135	113	128
50% Loose Rock..... 2 yd.	100	90	75	85

SOLID ROCK OR HARD PAN

When properly shot. — This is to be 50% of Column No. 1 (Sandy Clay or Loam).

Fig. 1—Sample Production Schedule Sheet on Grading, Other Units of Equipment and Hourly Labor Quantity Schedules Are Covered by These Forms.

ods of competition, and include, among other things, the following:

To understate or omit the lowest reasonable cost of any item required by the proposal;

To bid, contract or sell for less than reasonable cost;

To use less than the lowest reasonable cost standard established by the trade practice department in estimating the lowest reasonable cost;

To use more than the highest reasonable productive capacity in estimating the lowest reasonable cost;

Failure to file the standard estimate sheet with the bid or proposal; and,

To use prices in the estimate sheet or proposal lower than the lowest reasonable cost fixed by the standards or lower than the prevailing prices for material, unless such lower prices have been filed five days prior to the opening of bids.

SCHEDULE "G"

CONCRETE PAVING COST SUMMARY

Compute your costs on a square yard or cubic yard basis, or both, depending on the units shown in the proposal. Preserve your work sheets to support the data shown herein as such work sheets may be required by the Highway Construction Industry and must be furnished upon request.

Do not over-estimate your production. Performance records for every job are on file with the State Highway Commission and are available to the Examiners who will check your past performance to determine the correctness of your production estimate.

ITEM	Total Cost	Cost per Sq. Yd.	Cost per Cu. Yd.
1. Materials (from Line 10, Schedule "C", page 4)	$	$	$
2. Labor (from Line 16, Schedule "D", page 5)			
3. Equipment (from Line 53, Schedule "E", page 6)			
4. Hauling (from Line 3, Schedule "F", page 7)			
5. ..... % of Non-Productive Costs (from Schedule "B", page 3)			
6. Shouldering (When Not a Bid Item) (from Line 9, Schedule "H", page 9)			
7. Total Direct Costs	$	$	$
8. Job and Company Overhead Costs: Telephone, Telegraph, Hotel, Travel Expense, Office Supplies and Expense, Insurance not Based on Pay Roll, Miscellaneous Freight and Express, Interest on Project Fund (Operating Capital and Borrowed Funds), General Company Overhead, Contingencies, Surety Bond, State Code Assessment, Etc. Not less than 12% of Line 7			
9. Total Cost (Line 7 + Line 8)	$	$	$
10. Unit Price Bid $			

This space is provided for your computations.

Fig. 2—Sample of Summary Sheet. Each Division of Construction Has a Set of Schedules and a Summary Sheet Along With Certificates That Must Be Sworn.

The trade practice standards also prohibit unfair trade practices involving:

Bid shopping;

The failure to pay subcontractors and material vendors their proportionate amount of partial payments received by the contractor;

The financing of the contractor by a subcontractor or material vendor;

The defamation of a competitor; and,

Other unethical practices.

Development of Estimate Schedules.—Referring again to the estimate sheet, or cost summary, all factors of cost and production were developed from the experience secured from contractor members of the industry and broken down as minutely as possible into the items involved in these schedules. The rental value of equipment was determined by first applying the average number of operating days in each of the divisions of the industry, for the State of Wisconsin. In the grading division, for illustration, experience developed that the maximum number of hours of operation per season was 1,200. As an example, let us take a one-yard shovel. It was determined that the following factors entered into the hourly ownership and operating cost: depreciation, overhaul, repairs and painting, interest, taxes, storage and insurance. These factors applied to the 1,200 operating hours, and the price of the shovel, developed the expense per working hour. To this is added the operating expense, which includes fuel, oil and grease.

Then the maximum and minimum production schedules provide for a maximum amount of production for this shovel in the different types of common, loose rock, and solid rock excavation.

This provides a very simple way of developing a cost for the use of this shovel which can be illustrated by applying these factors to a project involving 100,000 yards of common excavation, under the classification of sandy clay or loam.

The classification provides a maximum production of 100 yards per hour for this shovel, requiring 1,000 hours of operation. The ownership and operating expense per hour for this shovel is $6.85. Therefore, that item of cost is definitely developed as $6,850.

It must be kept in mind that these are average costs and that the contractor is privileged to add to this cost any amount that in his judgment is necessary.

Another important item of cost included in the estimate sheet is that of "overhead." This item is definitely established for each division of the industry and is under the heading of "Job and General Company Overhead Costs." The factors in this item include: telephone and telegraph, hotel and travel expenses, office supplies and expense, insurance (not based on payroll), miscellaneous freight and express, interest on project fund (operating capital and borrowed funds), share of general company overhead, contingencies, surety bond, and state code assessment.

Insurance is developed as a minimum factor covering compensation and public liability, and this item is based upon the rates for the several classifications by the Wisconsin Compensation Rating and Inspection Bureau. It is a basic rate, not based on penalties or credits. To this is added property damage, riot, unemployment, and federal old age benefit.

These latter two items of cost; namely, overhead and insurance, are pre-established and applicable to every bid.

With reference to the production schedules, I refer to the official estimate sheet of the grading summary. Through experience of the contracting fraternity, we have developed several production schedules, one covering "Roadway Finishing" which has been a matter of much uncertainty in the estimate of the contractor. This schedule sets up a minimum number of man and machinery hours for each station, and includes the items of common labor, tractor operator and blade man under "Labor," and tractor and grader under "Machinery."

This grading estimate sheet also includes a production schedule for the placing of culvert pipe and has developed the number of cubic feet of excavation necessary for the different sizes of pipe, the minimum requirements in hours per cubic foot, the minimum hours of labor for excavation and backfill per linear foot of pipe, and the minimum number of hours for laying pipe.

The schedule also provides minimum requirements of labor for guard rail construction.

These production schedules, while not complete in each item of the proposal, nevertheless have had a tendency of leveling out many items that were previously bid below cost. It has had the further effect of balancing a bid and more or less supporting the bid of the contractor for the major items.

SCHEDULE "E"

EQUIPMENT OWNERSHIP AND EXPENSE SCHEDULE FOR PAVING SUMMARY

Ownership Daily Cost Rates used are based on the A. G. C. manual rates adjusted to meet Wisconsin conditions. They include depreciation, interest on investment, major repairs and overhaul, insurance (fire and theft), taxes, storage, and incidentals. Operating costs included in the totals listed below include field repairs and all costs of operation, EXCEPT WAGES FOR THE OPERATORS OR ANY OTHER LABOR. Use blank spaces at bottom of sheet for equipment which is not listed on the sheet.

	Location of Equipment	Number Units Needed	Total Hourly Ownership and Operating Cost	Total Hourly Cost
1. Crane and Bucket			$ 4.50	$
2. Proportioning Plant — Complete			1.15	
3. Cement Bin, Weighing Device, Etc.			1.80	
4. Cement Scales, Buggies and Platform			.32	
5. Car Mover — 2 Ton or Larger			1.02	
6. Forms — 9" Load Bearing per 1,000 Ft.			.80	
7. Forms — 10" Load Bearing per 1,000 Ft.			.85	
8. Tractor — 30 H.P. Gas or Diesel			1.70	
9. Tractor — 60 H.P. Gas or Diesel			3.25	
10. Scarifier			.30	
11. Bulldozer — For 30 H.P. Tractor			.45	
12. Grader — 10 Ft. Blade			.50	
13. Grader — Power Control — 10 Ft. Blade			1.00	
14. Grader — Power Driven — 10 Ft. Blade			2.60	
15. Fresno			.15	
16. Sub-Grader — 18 or 20 Ft.			.80	
17. Sub-Grader — 30 Ft.			1.20	
18. Power Sub-Grader — 18 or 20 Ft.			6.00	
19. Power Sub-Grader — 30 Ft.			6.50	
20. Form Trenches — Gas			1.35	
21. Sub-Grader Planer — 18 or 20 Ft.			37	
22. Sub-Grader Planer — 30 Ft.			.55	
23. Roller — 3 Ton — 3 Wheel			1.05	
24. Paver — 21E			5.40	
25. Paver — 27E			7.30	
26. Turntable			.68	
27. Vibrator			.50	
28. Concrete Strike-off			.16	
29. Finishing Machine — 2 Screed — 18 or 20 Ft.			2.55	
30. Finishing Machine — 2 Screed — 30 Ft.			3.15	
31. Longitudinal Finisher			2.10	
32. Pavement Bridges			.10	
33. Pipe Line — 2 in. per 1,000 Ft.			.08	
34. Pipe Line — 2½ in. per 1,000 Ft.			.12	
35. Pipe Line — 3 in. per 1,000 Ft.			.16	
36. Pumping Unit — 80 Gal. High Pressure			1.78	
37. Tar Kettle			.27	
38. Truck — Pick-up			.70	
39. Truck — 1½ Ton Platform			1.00	
40. Automobile — Small			.55	
41. Camp and Office Wagons			.10	
42. Repair Outfit and Tool Shed			.40	
43. Small Tools			1.00	$1.00
44. Team				
45.				
46.				
47. Total Hourly Cost				
48. Total Working Hours				$
(From Line 9, Page 2, Plus 20 Hours for Set-up)		Hours		
49. Total Equipment Charge (Line 47 x Line 48)				$

(Forward this Figure to Line 3, Schedule "G", Page 8)

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Fig. 3—Sample Equipment Estimate Sheet for Concrete Paving. Every Phase of Labor and Equipment is Covered by These Sheets Which Establish Certain Definite Rates and Output.

Bid Examination. Referring again to procedure, the code provides that one of these estimate sheets must be filed with each bid in a separate envelope. The examiners sit with the highway officials when the bids are opened and receive the estimate sheets. These examiners and their staff correct the estimate sheets and return the sheet to the contractor with the comments of the examiner. This latter procedure was essential in developing a program of education.

Where protests are lodged against the bidder, the sheet is retained and is the basis for the prosecution of the protest.

Returns to Labor. In connection with the code activities during the past two years, we entered upon the study of the payrolls of the contractors to determine the amount of return the worker secured through highway contracts. We did this in order to determine whether or not labor, which we realize is a

big factor in the highway construction industry, was securing a return that would make them satisfied workers and boosters.

This study developed the fact that during the year of 1936 laborers received, in many parts of Wisconsin, a wage less in some instances than they would have received from some relief occupation. We presented this matter to the Industrial Commission of Wisconsin, which body sets the minimum wage rate for all highway construction work in the state, and the result was a substantial increase to every classification in the industry.

It developed in 1937 that the return to the workers had not been substantially increased in spite of the fact that it is estimated that workers were paid nearly a million dollars more in wages than they received in 1936. Further investigation developed that this condition was brought about because of the fact that the contractor in an effort to operate for more than the allotted number of hours per day or per week, as provided for in the contract, organized several shifts and in no case was the worker able to secure a full eight-hour day or work for a full 40-hour week.

We then appealed to the State Highway Commission of Wisconsin with a remedial suggestion that the highway program be prosecuted on an eight-hour-machinery day. It is needless to say that there was a great deal of hesitancy in adopting this plan, both on the part of the State Highway Commission and the U. S. Bureau of Public Roads, but after due consideration, it has been made effective and is now in operation.

Results. We believe that this plan will have two stimulating effects: first, it will spread the work out among a greater number of contractors; and second, it will insure the worker of a full week.

A code of fair competition for the highway construction industry can best be justified by the fact that because of the large productivity of the industry, as compared with the amount of available work, it is practically impossible to regulate competition on the basis of fair prices or even prices below cost, within the industry.

The best evidence of this fact is secured from the records of the state highway commission under the prequalification plan which has developed that contractors have qualified on the basis of finance, experience and equipment under our plan, for 165 million dollars' worth of work and this year, with one of our largest programs being prosecuted, the state will be able to provide only 15 million dollars' worth of work. In other words, if we could retire 10 out of every 11 contractors, there would be just enough work to provide for those who were retained.

We find that this condition prevails in several of our midwestern states, but it is easily ascertainable if a prequalification plan is in effect.

Conclusion. The highway construction industry wishes to pay its highest respects to the State Highway Commission of Wisconsin for its whole-hearted co-operation in this undertaking and we are sure that without that co-operation we would have had difficulty in succeeding.

We will be more than happy to assist any other highway contractors' organizations in efforts along these lines and ask, as compensation, only their experience after is has been made effective, believing that an exchange of experience is the only way that the plan can be made perfect.

Montana National Bituminous Conference, October 10 to 13

Conflict with other meetings has necessitated a change in the previously announced dates (October 17 to 20) for the Montana National Bituminous Conference. The time is now assured as October 10 to 13, and the place as the Edgewater Gulf Hotel, midway between Gulfport and Biloxi, Mississippi.

The program this year will cover not only low cost bituminous surfaces but all classes of high type asphaltic surfaces. It will consist of 4 sections: (1) Progress in Research as Related to Construction and Maintenance of Bituminous Surfaces, (2) Fundamentals of Bituminous Construction, (3) Construction of Bituminous Surfaces, and (4) Maintenance of Bituminous Surfaces.

Following are the respective chairmen of these sections: (1) Mr. N. W. McLeod, Research Engineer, Department of Highways and Transportation, Regina, Saskatchewan, Canada; (2) Mr. T. E. Stanton, Materials and Research Engineer, California Department of Public Works, Division of Highways, Sacramento, California; (3) Mr. V. B. Steinbaugh, Deputy Commissioner-Chief Engineer, Michigan State Highway Department, Lansing, Michigan; and (4) Mr. A. B. Nuss, State Highway Engineer, Kansas State Highway Commission, Topeka, Kansas.

These four men are internationally known authorities on bituminous research, fundamentals, construction and maintenance. Each chairman is being assisted by a committee of 12 persons. These committee members have been engaged for the past two months in preparing papers and assembling data on subjects assigned to them by the chairmen. Their papers and other material are to be submitted to the chairman of each section by August 10th.

From this material prepared by the committee members the chairman will present a summary to the conference covering all phases of his conference section, analyzing the various methods and practices, bring out all new developments and discuss problems pertaining to different localities, current controversial points, and will make a complete survey of the entire field which his conference section represents. The chairman's paper will require from 1½ to 2 hours for presentation.

Following the delivery of the paper a discussion period of from 1½ to 2 hours will be held on each section. The committee members will serve as conference boards during these discussion periods to lead in and assist with the discussions.

The State of Mississippi and the Mississippi Highway Department extended an invitation to hold the meeting this year in their State, and are acting as hosts and co-operating in every way to make the conference a success.

The meeting place is served by U. S. Highway No. 90 and the Illinois Central and Louisville and Nashville Railroads. The hotel has named a rate of $7.00 per day per person for the conference. The finest 18-hole golf course in the South is located on the hotel property and the greens fees will be waived. Delegates will also be granted free use of the hotel tennis courts and swimming pool, as well as a private pier into the Gulf.

Mr. D. A. McKinnon, Montana State Highway Engineer, is General Chairman of the Executive Committee, and C. M. Boggs, President of the Western Petroleum Refiners Association and D. L. Cheney, Bituminous Engineer, Montana State Highway Department, are Vice Chairmen.

The New Bridge on the Princeton-Rosedale Road, Built at a Cost of $27,000

MERCER COUNTY BRIDGE COMBINES BEAUTY WITH ECONOMY

By LESLIE R. SCHUREMAN

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MERCER COUNTY, New Jersey, has recently completed the construction of a highway bridge which is of interest chiefly as a contradiction to the generally accepted theory that beauty in a bridge can be attained only at added cost. This structure, which has drawn much favorable comment, is located a short distance from Princeton on the Princeton-Rosedale Road and was completed in March of this year. It replaces a light pony truss bridge, built in 1886 and posted for a maximum load of 6 tons, whose narrow roadway and very poor approach alignment constituted serious traffic hazards and whose appearance marred an otherwise unusually beautiful drive. The bridge is situated on a section of the road which is particularly rich in natural beauty and which is included in the county plan for eventual parkway development.

In planning the new structure three major objectives were set up as essential to a satisfactory design: ample roadway width, safe alignment, and an appearance in harmony with the beauty of the surroundings. Waterway requirements fixed the clear span at 70 ft. Borings revealed sound shale not far below the bed of the stream. As a first step in the design estimates of cost were made for the various types of bridges which could be used. On the basis of this cost study the rigid frame type of bridge was selected as the most economical. Having chosen the type of structure to be used, the next step in the design was a study of possible architectural treatments. Many rough sketches, side elevations and perspective drawings were made in the effort to obtain the most pleasing lines and proportions of the parts as well as the whole and the finished appearance most in keeping with the character of the site. In the course of this study, stone facing naturally presented itself as the most appropriate surface treatment. It has been the practice of the county for some years to salvage, and store for future use, stone taken from substructures of obsolete

The Old Structure, Built in 1886

bridges as they have been replaced with modern structures. A fairly large quantity of a good quality brown sandstone was available from this source. This stone was suitable and sufficient for facing but did not provide ringstones. Inasmuch as the available funds would not permit the purchase of ringstones it was necessary to devise a substitute for them. This was accomplished by extending a part of the concrete frame out to the surface in the form of an arch ring of the same size and shape as would normally have been used for the band of ringstones. This expedient not only removed an item of considerable expense but also gave a very pleasing effect. A limestone coping was provided to complement the concrete ring.

Structurally the bridge is much the same as all bridges of the barrel type of rigid frame with perhaps the exception of one feature. The frame is separated entirely from the wingwalls by means of premolded joint material in order to prevent cracking of the wingwalls from frame movement. The bridge was designed for H-20 loading and carries a four lane bituminous concrete roadway and two flagstone sidewalks.

The approach treatment was also made to conform to the setting and included stone footwalks, timber curbing, and a rustic timber guard rail. The slopes were seeded with grass and planted with honeysuckle.

The contract cost of the entire project was $33,300 of which about $27,000 was for the bridge proper. It is estimated that a saving of approximately 10 per cent was made through the use of the rigid frame type of bridge. The entire project was carried out under the direction of Harry F. Marris, County Engineer. Joseph Jingoli and Son of Trenton, N. J., were the contractors. The bridge was designed by the writer with the collaboration of Harry A. Kersey, Assistant Engineer of Bridges for Mercer County.

The Approach Treatment Conforms to the Surroundings

Conclusions on Test Procedures for Different Abrasion Machines

Los Angeles and Deval rattler test results on stone and gravel made by the Concrete and Aggregate routine section of the Texas State Highway Department testing laboratory during 1935 and 1936 were submitted to the Concrete Research section for analysis, conclusions, and recommendations prior to the adoption of Texas' new standard specifications. The concrete research section undertook an investigation the purpose of which was to determine whether or not the Los Angeles rattler abrasion test is superior to the Deval abrasion test, and also to determine the optimum wear limits for aggregates for use in concrete and in asphaltic surface courses.

The samples of stone and gravel were classified as "satisfactory," "questionable," or "unsatisfactory" for use in concrete, and also for use in asphalt surfacing. The chief consideration entering into this classification was the service record of the vaarious materials. The classification was correlated with the respective test results, the correlation obtained being employed as a medium for evaluating the respective merits of the two abrasion tests, and for determining the optimum wear limits.

The concrete research section also conducted special tests by which to investigate the value of the Los Angeles rattler 100-revolution wear test, the accuracy of duplication of test results with the rattler, and the nature and degree of the correlation of the Rattler B and D grading tests.

Conclusions.—The chief conclusions reached in the course of the investigation are as follows:

1. The Los Angeles abrasion test is greatly superior to the Deval abrasion test in its ability to distinguish between satisfactory and unsatisfactory aggregate for use in concrete and in asphalt topping. It is also superior in several other respects.

2. The optimum Los Angeles wear limits (500-revolution test) for both stone and gravel are as follows:

   a. For use in concrete..... 40.0 per cent
   b. For use in asphalt topping... 35.0 per cent

It must be borne in mind, however, that in the selection of these optimum wear limits the investigators were confronted with the problem involved in avoiding Scylla.

3. The 100-revolution Los Angeles rattler wear test is worthless, not only as an indicator of the amount, or of the softness, of soft material in a sample, but even as an indicator of nonuniformity in hardness of a sample.

4. The best method of exercising some degree of control over the uniformity in hardness of aggregate for use in asphalt topping is by adopting the following clause and applying it through the medium of a recommended test procedure:

"When separated into two equal parts by visual inspection the softer portion of a representative sample of the aggregate shall not have a Los Angeles rattler wear ("D" grading test charge; 500 revolutions) exceeding by 5.0 per cent the specified maximum allowable wear."

5. It is reasonably safe to assume that a single Los Angeles rattler wear test result will not vary from the true, or average, per cent of wear of the material being tested by more than 2.0 per cent.

6. The Los Angeles rattler "D" grading test will, on the average, produce a result equal to the result of a "B" grading test on the same material $\pm$ 2.5 per cent.

CONCLUSIONS OF INTERNATIONAL ROAD CONGRESS

THE 8th Congress of the Permanent International Association of Road Congresses which convened at The Hague, Netherlands, on June 25, was attended by delegates from nearly 50 countries. The 7th Congress was held in Munich, 4 years ago. The agenda of the 8th Congress dealt with the following subjects:

FIRST SECTION (CONSTRUCTION AND MAINTENANCE)

First topic:

Progress accomplished, since the Congress at Munich, in the use of—

a. Cement on road surfaces.
b. Brick surfaces.
c. Surfaces in special materials, such as cast-iron, steel, rubber.

Second topic:

Progress accomplished, since the Congress at Munich, in the preparation and use on roads of—

a. Tar.
b. Asphalt.
c. Emulsions.

SECOND SECTION (TRAFFIC, IMPROVEMENT, AND ADMINISTRATION)

Third topic:

Accidents on the road.

a. Bases of statistics and their unification.
b. Determination of causes of accidents, and means for diminishing them.

Fourth topic:

Segregation, on the route, of the different means of transportation: Roads (one and two lanes), bicycle tracks, footpaths, parking spaces and exit roads, crossings and crossroads.

a. Study of the circumstances under which these should be recommended or advised against.
b. Application to automobile routes.

FIRST AND SECOND SECTIONS (COMBINED)

Fifth topic:

Study and standard of quality of a road surface from the viewpoint of—

a. Its slipperiness or ruggedness, and its resistance to skidding.
b. Its property of reflecting or absorbing light (under artificial lighting).

Sixth topic:

Study of road subsoils:

a. Determination of properties of subsoils, testing methods, equipment.
b. Influence of these properties on road construction (base and surface) and on road maintenance.

Reports on these topics were submitted by reporters from the various countries, and on June 25 at a plenary session conclusions, based on these reports, reached during the various sessions were formally adopted. These conclusions were as follows:

First Section (Construction and Maintenance)

Progress, Since the Congress at Munich, with the Use of Cement for Road Surfaces

1. The conclusions adopted at the Munich Congress are still valid.

2. In nearly all countries the formation of cracks has been reduced by improved treatment of the subsoil, better quality and improved placing of concrete, and more efficient arrangement of joints and disposition of reinforcement where it is used.

3. In most countries the cement content has been reduced since 1934.

4. Joints are still the weakest feature in concrete road construction because they allow the slabs to move relatively to each other and also frequently allow water to percolate.

5. The use of dowels has increased as they reduce the relative movement of the slabs.

6. There is still a need for waterproof joint construction which will be efficient and inexpensive.

7. Concrete surfaces laid since 1934 and many of those laid before have proved satisfactory nearly everywhere, maintenance having been limited to refilling the joints, except where there has been subsidence on bad subsoil.

8. An increased use of concrete surfaces is to be expected as it has been proved that with due care in execution they can be durable, even and have a satisfactory surface texture.

9. The construction of cement macadam surfaces has only slighty increased. With good materials and mixtures and care in execution, surfaces can be constructed which are satisfactory for roads with light traffic.

Attention should also be paid to rolled or tamped concrete surfaces containing large aggregate and comparatively little cement.

10. There have been only slight changes since 1934 in the use of concrete as a foundation for other surfaces. Experiments have been made with very lean mixtures.

11. Surfaces of precast concrete units only deserve consideration where roads have to be opened to traffic as soon as possible.

12. Surfaces of thin concrete units or tiles are suitable for cycle tracks and footpaths.

Brick Surfaces

1. In consequence of the great differences between the raw materials used in different countries it is not possible to establish general standard specifications for the quality of bricks.

2. Surfaces of bricks, laid on sand without a prepared foundation, are not suitable for roads carrying fast and heavy traffic.

3. Surfaces of bricks, laid on sand on a prepared foundation, have to be relaid from time to time.

4. The filling of the joints, e.g., with asphalt and cement mortar, makes the surface more durable.

5. If the joints are filled with asphalt mortar, it is important to use a filling material which does not exude by traffic or in warm weather.

6. Bricks laid in mortar have not yet been tested sufficiently to permit definite conclusions concerning this method.

7. The possibility of using brick surfaces depends on the local materials available as well as on the cost in comparisons with that of other surfaces, such as concrete and asphalt.

8. The advantages claimed for bricks are, in some cases, their satisfactory surface texture and pleasant color, and in some cases their durability.

Surfaces in Special Materials, Such as Cast-iron, Steel, Rubber

1. The use of iron in road surfaces has not yet been sufficient for definite conclusions to be drawn concerning its value. The general use of iron block paving cannot, for the time being, be expected on account of its high first cost and the difficulty of maintaining a non-skid surface.

2. Rubber surfaces are still expensive in first cost. Their use in the near future will be limited to places where special value is attached to absence of noise and vibration.

3. A small addition of rubber powder or latex to asphalt mixtures seems to reduce the voids and at the same time to improve the non-skid qualities of the surface. Further tests are, however, desirable.

Progress Since the Congress in Munich in the Preparation and Use of Tar, Asphalt, and Emulsions on Roads

1. Since 1934 important progress in the construction of asphalt and tar roads has been reported, but the ever-increasing motor traffic necessitates further thorough examination, theoretically and practically, of all factors which play an important part in this matter.

2. From a theoretical standpoint the following problems need special attention:

(a) The study of the constitution and physical qualities of bituminous binding material;

(b) The inter-action between binding materials and aggregates, especially as regards the displacement of bitumen by water as well as other factors.

3. The following problems in practical asphalt and tar road construction demand attention:

(a) Construction of cheap foundations, especially by using materials which are obtainable on the spot;

(b) the reconditioning of existing asphalt and tar roads, e.g., by covering them with thin non-skid wearing layers or carpets;

(c) the improvement and standardization of practical testing methods for bituminous binding materials and mineral aggregates as well as for bituminous mixtures and the wider exercise of control-testing in construction;

(d) The development of mechanical working methods not only for the improvement of the quality of the roads, but also for speeding up road construction and rendering it less expensive.

4. It is important to select a bituminous binder having the correct viscosity for the work to be done.

The viscosity of the emulsion to be used for surface dressing is of the utmost importance as regards the quantity of binder and the size of chippings required; the larger the chippings that are used the higher must be the viscosity of the emulsion.

5. The following conclusions may be drawn regarding the quality of asphalt and tar surface:

(a) Slipperiness:
This can be eliminated by the choice of suitable materials and mixtures and care in construction.

(b) Wave Formation:
Considerable improvements have been reported. Mechanical working methods can render good service in this respect.

(c) Light Absorption and Reflection:
In this respect the properties of the surface need further improvement.

In addition to the conclusions the assembly adopted the following:

It is recommended that the International Committee appointed for the examination of tests for emulsions should be instructed to pursue its deliberations in regard to additional tests, including those for semi-stable and stable emulsions.

It is recommended that a permanent organization should be established under the auspices of the Permanent International Association of Road Congresses to consider the methods now in use for testing road materials and to compile a summary of the methods under investigation in various countries with the ultimate object of establishing an international code of testing methods.

The assembly having noted that most European countries have adopted the same tar viscometer express the hope that other countries who have to choose yet a viscometer will adopt that instrument and the same methods of using it.

Second Section (Traffic, Improvement and Administration)

Accidents on Roads: a, Bases of Statistics and Their Unification; b, Determination of Causes of Accidents and Means for Diminishing Them

1. It should be defined what should be understood by a "road accident."

2. It is preferable that the reports on road accidents should be made by the local police authorities or other expert officials and that each report should be recorded on a separate standard form and summarized centrally.

3. It has been observed that the different views which exist concerning the "cause of the road accident" has led to widely divergent lists of causes used for the statistics of the various countries and it is desirable that as a starting point the "causes présumées ou apparents de l'accident" inserted in the report C.276 M.179, 1937, VIII of the League of Nations Committee for the unification of the statistics of road traffic accidents should be accepted even in a less detailed form.

4. The Congress supports the principles of the League of Nations Committee, mentioned under 3, concerning an annual minimum publication of the results of road accident statistics, taking into account that international cooperation in this matter can only be obtained within a measurable space of time when the obligatory part is briefly worded.

5. The Permanent International Commission and the Executive Bureau of the Permanent International Association of Road Congresses should appoint an international Committee for the purpose of studying the progress of the unification of road accident statistics. This Committee should take into consideration as well the principles of the report, dated May 28, 1937, of the League of Nations Committee as the present conclusions; and should submit before Dec. 31, 1940, the experiences gained as well as a report of further observations.

6. The Permanent International Commission and the Executive Bureau of the Permanent International Association of Road Congresses should appoint an international committee for the purpose of studying the basis and the International comparability of traffic censusses in relation to road accidents and that the committee should submit a report before Dec. 31, 1940, on its conclusions.

7. It is desirable for the various governments to support the work of the safety organizations in the various countries as much as possible and to consider the introduction of compulsory safe traffic teaching in elementary and higher schools.

8. The Congress having noted the many measures in the various countries to reduce the number and the seriousness of road accidents, expresses the hope that the interchange of ideas in the published reports may lead to such an improvement in traffic conditions on the road and in the streets and to such an improvement in education and discipline of the road users that a considerable decrease in the number and seriousness of road accidents may result. Furthermore, all measures should be taken to insure that assistance is given, as soon as possible, to persons who have been injured in road accidents.

9. It is advisable to investigate every road accident and record the sites so as to ascertain where they occur most frequently, and determine whether road conditions can be improved at these sites from a safety point of view and at the earliest possible date.

Segregaton on the Route of Different Means of Transportation: Roads (1 and 2 Lanes), Bicycle Tracks, Footpaths, Parking Spaces and Exit Roads, Crossings and Crossroads

General.—1. Road safety should be the primary consideration in determining the extent to which the different classes of road users and traffic streams should be segregated.

2. Apart from the requirements of safety, the carrying capacity of the road, the speed of traffic and also financial considerations are important factors to be considered in dealing with this question.

3. Before the construction or reconstruction of a road system is undertaken, surveys of present and future traffic requirements and general economic considerations should be made and planning should take into account the necessity of correlating national road systems at international frontiers.

4. It is necessary that the technical measures adopted with a view to separating the various classes of traffic and the opposing streams of traffic in so far as they are not enforced by the layout of the road should be supplemented by uniform regulations in each country, and so far as possible internationally.

The occupation of the roads for purposes in themselves important, but not directly related to road traffic, should always be subordinated to the requirements of road traffic which are much more important.

Roads for Mixed Traffic.—5. Footpaths are necessary at least where buildings adjoin the roads or where considerable pedestrian traffic between adjoining communities exists or may be expected.

6. It is always desirable to separate pedal cyclists from motor traffic. This becomes essential as soon as traffic has developed to any considerable extent. If possible this should be effected by providing cycle tracks on either side of the road.

7. Cycle tracks should be effectively separated from the carriageway. Traffic lanes forming part of the carriageway are considered an undesirable substitute from the point of safety, but sufficient experience has not yet been obtained as to the best methods of dealing with cycle tracks where road junctions and lay-byes are numerous.

8. In all countries with heavy pedal cycle traffic, particularly in the areas adjoining large towns as well as in picturesque districts, it is desirable in addition to the cycle tracks along main roads mentioned above to construct a network of special cycle tracks independent of the existing road system to serve the need of tourist cycle traffic.

9. On roads with considerable traffic the number of excess roads to farms, etc., should be reduced to a minimum. In cases where these are numerous or cannot be eliminated it is advisable to provide service roads for agricultural traffic for the purpose of minimizing interference with the main road.

10. The provision of service roads for local traffic is necessary in all built-up areas of any considerable importance in order to separate local traffic from through traffic.

11. The construction of service roads within the meaning mentioned under 10 should not be undertaken unless the provision of them has proved unavoidable since they tend to encourage ribbon development which is considered objectionable from the standpoint of road administration as well as from an aesthetic point of view.

12. Ribbon development should be restricted as much as possible on or near main truck roads and prohibited in case of new roads and new road sections (by-passes).

13. Road safety is considerably increased by a physical division of opposing traffic streams, but this remedy is only possible if the road has at least four traffic lanes.

However a road with a single carriageway divided into four traffic lanes has a greater traffic-carrying capacity during rush hours than one having dual lanes with a central reservation. The increased capacity is achieved at the sacrifice of safety and this type of layout accordingly should only be taken into consideration under special local and financial conditions.

14. Continuous accommodation for use of temporary stationary vehicles on the outer verges of roads is very desirable for traffic and safety reasons, especially on roads carrying high speed motor traffic. If it is not possible to provide this accommodation then the need is indicated for parking places, capable of accommodating at least one lorry and trailer at regular intervals.

15. Parking sites of a larger size should be available wherever the need arises for allowing large numbers of vehicles to stop, so that the main road may be clear for through traffic.

16. It is advisable to avoid the use of crossings on the level in cases where the costs are not prohibitive.

17. Traffic "circuses" with adequate dimensions where the "roundabout" system is in force are to be recommended on crossings of important roads, in particular in cases where more than four streams of traffic converge. Pedal cyclists and pedestrians should not cross on the same plane as high-speed motor traffic if this can possibly be avoided.

18. Pedal cycle traffic crossing motor traffic (as in the case where a cycle track crosses from one side of the road to the other) presents a special cause of danger. If this cannot be avoided by the use of subways or bridges, both motor and cyclists traffic should be warned well in advance by a clear system of signals or signs. The beginning and the end of cycle tracks must be specially indicated.

19. Apart from the above it is not possible to lay down guiding principles with regard to crossings in view of the fact that the most likely solution in each particular case is chiefly dependent on local conditions.

Motorways.—20. The question whether—apart from the ordinary road system available for all sections of road users—special roads should be constructed for the exclusive use of highspeed motor traffic, depends on the demographic, topographic and economic conditions in each country and is in addition closely connected with the volume, character and condition of the existing road system in that country.

21. Motorways, i.e., roads reserved exclusively for motor traffic present the most satisfactory solution for long distance traffic both from the point of safety and as regards speed and traffic-carrying capacity.

22. On motorways the division of traffic into two streams by means of a central reservation is absolutely essential. Each roadway should be provided with two traffic lanes of ample width, one of these being reserved for overtaking vehicles.

23. If planted with shrubs the central reservation not only provides a very effective division but is also a safeguard against dazzling headlights, at any rate on level road sections.

24. Ribbon development requiring access should be prohibited from motorways.

25. Footpaths should not be provided along these roads. For cycle traffic a separate location is the most suitable. If cycle tracks are provided along the motor roads they should be kept entirely separate from these.

26. No roads should be allowed to cross motorways on the same plane. At points where motorways join a system of town roads and at crossings of two motorways of equal status near a built-up area, the provision of traffic "circuses" where the "roundabout" system is in force may prove a satisfactory solution.

Streets.—27. Apart from pavements for pedestrians the streets in towns and built-up areas cannot generally be divided for the use of the different classes of road users.

28. On the main arteries in suburban areas—especially on those that link up with trunk roads—it is advisable to segregate through traffic from local traffic by providing, on either side, service roads for slow-moving traffic (including pedal cyclists).

29. In countries with a considerable cycle traffic it is desirable, also on other through traffic roads in suburban areas to construct separate cycle tracks alongside or on pavements. Wherever this is possible different quarters of a town should be linked up by cycle tracks running through parks or public gardens.

30. In broad streets traffic streams coming in opposite directions should be segregated by refuges, which are much appreciated by pedestrians crossing the road.

31. Regulations restricting or forbidding parking, and one-way traffic regulations are in many cases unavoidable to increase road safety and the traffic-carrying capacity of narrow but busy streets.

32. In towns provisions should be made for the crossing of carriageways by pedestrians at defined points. Guard rails should be erected to prevent crossing elsewhere.

33. Riding tracks should be provided as far as possible in the neighborhood of large towns and military establishments, the particular circumstances in each case being taken into account.

34. It is desirable that at the next (9th) International Road Congress special consideration should be given to the question of streets (cross section, crossings, etc.).

First and Second Sections Combined

Study and Standard of Quality of Road Surfaces from Viewpoint of Slipperiness and Light Reflecting or Absorbing Property

1. The grip of the road surface is caused by the presence of projections and the number, size and nature of these are important.

2. The slipperiness of the road is in general increased by the presence of water and under such conditions the friction coefficient always decreases with increase in speed.

3. Water may be prevented from forming a continuous layer beneath the tire by the presence of projections of such nature that the tire can always make tractive contact with the road surface.

4. Roughnesses can be so coarse as to disturb the contact between the vehicle and road surface and thereby may increase the risk of skidding.

5. The amount of binder in the top surface should be limited so that it does not form a smooth continuous layer during any part of the useful life of the road.

6. Taking into account the principles of conclusions 1, 3, 4 and 5 one can construct with many different materials road surfaces possessing in a dry as well as in a wet condition a sufficiently high coefficient of friction for all normal operating conditions.

This has been shown with speeds up to at least 80 km. per hour.

7. The presence of loose granular material on the surface of the road should be avoided, and when strewn on ice-covered roads, means should be adopted of assisting fostering its penetration into the ice.

8. The resistance to skidding offered by road surfaces of different degrees of roughness may be compared only if the methods of tests are the same.

It, therefore, is necessary to prescribe uniform methods for measuring the longitudinal and transverse friction.

9. The quality of a road lighting system is determined by the ease with which objects can be seen on a road which in turn depends upon the contrast between the object and the background and the glare experienced by the observer. In general the background is brighter than the object. In this connection an important characteristic of the road surface is its brightness factor (B/E) especially in those directions in which the reflected light reaches the eye of the road user.

10. To meet both wet and dry conditions when lighting a road by means of fixed units it is desirable that the road surface be moderately smooth and light in color.

11. Light colored road surfaces with a non-skid texture are an aid where the motorist has to depend upon his own headlights for vision.

12. The road surface should be so constructed as to prevent so far as possible the formation of a water layer, which tends to make the road surface act as a mirror, producing excessively bright, narrow streaks, causing glare and thus reducing visibility.

In addition to the conclusions the wish has been expressed that the 8th Congress should confer the power to form a "technical international committee" for the slipperiness of the road, for the purpose of determining, in the interval between the present and the next Congress, specifications of data for the investigation of slipperiness and of supplying definitions, as far as possible, for the specification of uniform tests, by the Commission Internationale Permanent des Congrès de la Route.

Study of Road Subsoils

General Considerations.—1. In most of the countries an endeavor has been made to obtain a non-ambiguous classification of soils based on their suitability for different purposes. It is advisable to try to follow a similar method of classification for all countries.

2. When conclusions concerning the suitability and the probable behavior of the soil cannot be drawn from observations in the field it is recommended that the characteristics of representative soil samples should be determined in the soil testing laboratories.

In laboratories generally similar methods and instruments are employed.

3. The development of field tests for the rapid determinations of soil coefficients is desirable.

Investigations.—1. A preliminary examination of the supporting power can be made in a speedy and inexpensive manner by testing the direct resistance of the soil to penetration, with suitable apparatus. Fuller information will be furnished by test holes dug to a relatively limited depth or by soil borings, made with a boring tool or shell-augur giving disturbed soil samples, or with a boring instrument specially constructed to give undisturbed soil samples.

2. The observation of the soil water level and its possible changes is very important.

3. The most important properties to be measured in the laboratory are: the compressibility, the particle size distribution, plasticity, permeability, internal friction and shrinkage. The results can be used to estimate the vertical movements both during and after construction and also the possibility of lateral yield of the subsoil. Where an embankment has to be constructed on soft strata, continuous observations of the changes in the pressure of the pore water in such strata may be necessary in order to control the rate of construction, so that lateral yield is prevented.

Construction of Roads.—1. When a road has to be constructed on a subsoil of low supporting power in certain circumstances use can be made of light weight filling material or a pressure distributing layer able to resist tensile stresses (e.g., fascine mattresses).

Alternatively soft layers can be removed by excavating or dredging if they are relatively thin, or if deep, entirely or partly displaced by filling material. In certain cases the use of explosives can hasten the result.

2. For less important roads on shallow soft subsoils a working method in which sand is placed only under the toe-line of the embankment down to the layer having supporting capacity may be considered. With this construction considerable subsequent settlement will occur.

3. Water can produce injurious effects, such as frost damage, softening or swelling of the soil or earth slips. Measures should be taken for rapid and efficient removal of surface water. If water can penetrate through the surface subdrainage is essential. Subsoil water which may cause damage should always be controlled or removed. Frost damage may be prevented by the use of an adequately thick subsurface layer of a material not susceptible to damage by frost. Sometimes an isolating or intercepting layer, preventing capillary rise of water will be sufficient. In many instances frost boils can be prevented and frost heave restricted by deep drainage.

4. The type of the road surface construction has to be adapted to the anticipated behavior of the subsoil. Where very irregular and rapid settlements are possible, a surface of small units (e.g., bricks, stone sets, etc.) can be considered.

Construction of Embankments.—In judging the stability of earth slopes and embankments important tests include the determination of the shear strength and the Atterberg limits. The reaction of the soil to moisture and to frost and the optimum moisture content for maximum density (Proctor test) should also be determined.

1. For the construction of embankment it is preferable to use material not susceptible to volume changes, especially for the top layers.

Poor soils can be improved by interlayers of sand or coarser material or by thorough mixing with better material.

2. Good initial consolidation of the embankment is necessary and for this purpose a material having a particle size distribution giving minimum pore volume is desirable.

The embankment should be built up in layers of a thickness depending upon the method of consolidation. Cohesive soil can be consolidated by tamping or rolling; sand by vibrating, tamping or inundation.

The moisture content of the soil is of great importance for obtaining good consolidation.

Stabilized Surfaces and Base-courses.—The determination of the particle size distribution and the plastic limits of the soil is necessary.

1. Important progress has been made in the stabilization of soil not only for the purpose of making low cost roads of more simple nature but also for bases or foundations.

2. For such purposes soils of marked granular character, able to withstand weathering and usage, are combined with a binding agent in such a manner that a well graded mixture with a minimum of voids is obtained. Use is made of cement, tar, asphaltic materials, chemicals (salts) or waste products of industry.

3. On certain cohesive soils a method of obtaining increased stability by burning the upper soil layer has been employed.

The Congress expresses the wish that the Permanent International Commission will examine the opportunity of constituting a Committee to study the practice of field and laboratory tests for soils as developed in various countries, as a means of promoting methods of economical design and construction of roads.

▼

New Jersey Lights 220 Miles of Highway

A report on highway lighting by E. Donald Sterner, State Highway Commissioner of New Jersey, reveals that about 220 miles of highway have been illuminated in the last eight months. This includes the lighting of 52 miles of the White Horse Pike, which will soon have its entire 56 miles lighted from Camden to Atlantic City —the world's longest continuous streach of highway lighting.

Improved or newly installed lighting on state highways within city limits has been made in 157 municipalities. Financial and engineering assistance have been given the municipalities by the state highway department. Of the 21 counties in New Jersey, 11 which have been offered financial assistance to date are cooperating with the department in the safety lighting of dangerous intersections of county and state highways.

The state highway department also will assist in the safety lighting of municipal and state highway intersections where the night accident records show the need for improved illumination.

Molasses as Road-Making Material in India

Attempts to convert molasses at the Imperial Institue of Sugar Technology of India into an insoluble resinous product suitable for use as a road surfacing material have been fairly successful. Mr. B. P. Root, U. S. Dept. of Commerce, sent us the information from which the following digest was taken:

The improved process of manufacturing the composition consists in carrying out the resinification of molasses with a mixture of coal tar and asphalt in presence of acids such as sulphuric acid. The carbohydrates contained in molasses combine with the phenolic bodies contained in asphalt and coal tar to form a resinified compound perfectly insoluble in water and satisfying besides the following conditions:

1. Liquid at the time of application.
2. After being spread on the road, not melting in summer.
3. Not wearing away in heavy traffic.
4. Cheaper than other asphalt preparations in the Indian market.

The success of the operation depends on the preliminary removal of the last trace of moisture from molasses before mixing with other ingredients.

Exhaust molasses (about 132 lb.) is concentrated in an iron pan with constant stirring till the temperature rises to 135° C. with progressive thickening and the molasses can be drawn into strings. Dilute sulphuric acid (0.796 lb. of strong H_2SO_4, corresponding to 1 per cent or the weight of concentrated molasses, diluted 1:1) is added slowly and heated till the temperature rises further to 210°-230° C. A mixture of asphalt and coal tar (16.5 per cent each on the weight of concentrated molasses, that is 13 lb. coal tar and 13 lb. asphalt as usually 3/5th of the original molasses is left behind after dehydration) is melted in a separate furnace fitted with mechanical stirrers and treated with dilute sulphuric acid (1 per cent on the weight of the coal tar and asphalt of strong sulphuric acid, equivalent to 0.263 lb. diluted 1:1).

Easy to Handle.—Molasses treated with sulphuric acid, as described above, is then gradually incorporated in the acidified liquid asphalt and coal tar mixture, the stirrers running constantly. When the requisite proportions have been added, the heating is continued at atmospheric pressure till the test samples show absolute insolubility in water. The product is obtained in a pasty condition, easy to handle and suitable for application on the stone chips. The solubility of the product is almost nil. The composition of the resinified product is:

	Per Cent
Molasses concentrated	74.39
Sulphuric acid, sp. gr. 1.84, diluted to 1:1 to be added to molasses	0.74
Asphalt	12.31
Coal tar	12.31
Sulphuric acid, sp. gr. 1.84, diluted to 1:1 to be added to asphalt and coal tar mixture	0.23
	99.98

A good seal coating material is prepared by dissolving the molasses-asphalt-coal-tar composition prepared, as above, in the proportion of 1 lb. to 1 gal. of coal tar. The seal coating material is quite liquid and easy to apply to the road surface.

The road composition and seal coating material have been protected by Indian Patent No. 24582.

Method of Construction Using the Above Molasses Composition:

Coating the Stone Chips.—Two cubic feet of stone chips are taken in a half-drum provided with two wooden handles. The stone chips are then heated on fire and 6 lb. of molten molasses composition are added to it from a bucket. The drums are then brought to the ground and turned from side to side. The composition in this way spreads uniformly on the stone chips and gives a glossy appearance. If the composition forms a lump, it is broken by iron rods and distributed over the stones by working with iron ladles. The drums are then slightly re-heated and turned from one end to the other. This process goes on till a uniform coating is obtained. The stones are then left in a heap. For small stone chips 8 lb. of the material is found necessary for every 2 cu. ft. to give a uniform coating.

Thus for every cubic foot of coarse stones (1 in.-1½ in. diameter) 3 lb. and for small stones (½ in.-¼ in. diameter) 4 lb. of the molasses composition are required.

Construction of the Road.—The molasses tarmacadam road can only be made on a metaled foundation. The road is at first cleaned of dust using iron brushes. Brick on edge is put along both sides of the road. Diagonal ridges are then cut ont at distances of about 7 ft. and holes about 2 in. diameter 1 in. deep are dug in between ridges so that the road material may have a good binding with the metaled foundation. Before spreading the stone it is customary to sprinkle some melted molasses composition with a brush. Four pounds are sufficient for sprinkling on 100 ft. length of a 10½ ft. wide road. A 1½ in. layer of coarse stone chips covered with the composition is then spread uniformly on the road and the steam roller is worked for one hour till the stones are properly set. Any crevices are closed by some additional stone chips. The stones are somewhat sticky at first and are apt to adhere to the wheels of the steam roller but after settling over night they become quite hard. On the top of the coarse stones, a ½ in. layer of fine stones covered with the composition is spread the next day. For this purpose the stones are brought in baskets from the heap and sprinkled on the road with a rotating motion. The steam roller is then worked for 1-1½ hours till the stones set, small crevices being covered as before. Any dis-uniformity in the road is smoothened by Durmuts or hand-rammers. After two to three days when the stones have somewhat set, a thin layer of the seal coat is spread on the road and the next day finished with a layer of coarse sand. The road is ready for use after about a fortnight.

Note: Cost of making 1 sq. yd. molasses composition, Rs. 0-10-0; cost of making 1 sq. yd. of tarmacadam road, Rs. 0-15-0; cost of making 1 sq. yd. of concrete road, Rs. 3-10-0.

1 Rupee equals 37.5343 U. S. cents.

▼

HIGHWAY RESEARCH BOARD TO MEET IN NOVEMBER —The 18th annual meeting of the Highway Research Board will be held in the building of the National Academy of Sciences and National Research Council, 2101 Constitution Ave., Washington, D. C., on Nov. 30-Dec. 2, 1938, according to announcement made by Roy W. Crum, Director of the Board.

OBSERVATIONS BY THE WAY

By
A. PUDDLE JUMPER

¶ Note the automobile tail reflector on the batter post of this bridge over Little Cabin Creek in Oklahoma.

Most of the steel spans in this area have these reflector plates.

¶ This man wants to know if a stabilized soil road can be built here.

¶ Do not try to turn around in a road—go to an intersection.

¶ Charlie Murray dropped into that recollecting mood again and conjured some old-time terms. How many of them do you recall?

Skinner—Man who drove a team on a grading job. Master of arts at flicking a fly off the mule's rump or ear but not a Doctor of Divinity when it came to telling the mules what he thought of them.

Blanket Stiff—One of those labor nomads of railroad construction days who wandered from camp to camp looking for a job and carried his blankets along; usually slept out under the stars between camps.

Hobo—Man who hiked to construction job from wintering or "hole-in," would work the whole season, and then hike back to "winter."

Tramp—Man who tramped from job to job, working only long enough at each place to get money for immediate necessities and thus "see the country."

• •

¶ Note the sign on Superior Street, Cleveland, the one carrying the high level bridge. This picture is at the Public Square. Cleveland has about six of these signs for as many blocks

on Superior, warning "jay-walkers." Cards like shown here are given to "jay-walkers" by officers, and I learned from one of the officers that this campaign has become very effective in reducing the number of accidents due to "jay-walking."

• •

¶ On Anderson Hill road north of White Plains, N. Y., two types of night traffic aids are in place. One is the self-luminous center stripe made up of small glass beads embedded in a paintlike binder. The other, as shown by this poor night picture that I took, are luminous

CLEVELAND POLICE DEPARTMENT

WARNING

YOU have just crossed the street, against a RED LIGHT

This is a very dangerous practice, that has resulted in 33 DEATHS and 324 INJURIES during the year 1937

Stop Saving Seconds and Losing Lives

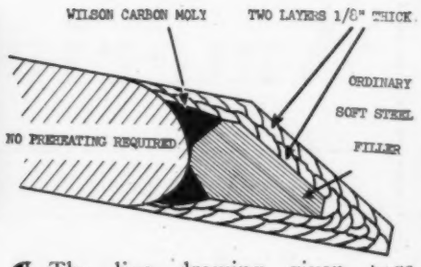
Obey Traffic and Safety Rules | Cooperate in Police Safety Campaign | It Is Better To Be Safe Than Sorry

USE CARE, COURTESY AND COMMON SENSE ON STREET

THANK YOU

CLEVELAND VALUES YOUR LIFE—PROTECT IT—WALK SENSIBLY

discs mounted on posts about four feet over the shoulder and glow brightly from your automobile headlights. I estimate the posts are about 400 feet apart on both shoulders.



¶ The line drawing given here shows a recommended method of renewing the cutting edge of worn bucket lips.

Ohio. I never heard of a "Bucyrus" Roller. Guess I was making mudpies when that was produced.

• •

¶ Two ends and the middle of a bad traffic hazard. The views were taken at an antiquated bridge site on Ohio No. 5 about seven miles east

of Ravenna. It was given the name of "Dead Man's Curve" because seven lives were lost prior to the time the sign was put up. Curve was so sharp that motorists would

keep going straight ahead. Both curves are practically right-angle

turns; i.e., there's a curve at either end of the bridge. Bridge itself is practically one-way.

EXIT ONE
from
DAYTONA BEACH MUNICIPAL JAIL
This card will identify you as a member of the convention and will be accepted in lieu of bond by the Daytona Beach Police Department for any ordinary cussedness. Don't drive when plastered.
Value? (Depends on how badly you need it.)

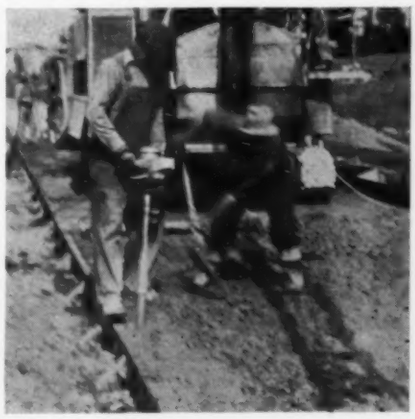
Courtesy card issued by a convention city to visiting de egates

¶ Clearing the right-of-way for a highway I ran into this outfit in Texas. It is a La Plant-Choate tree-dozer on a Caterpillar RD-8 tractor.

Note the snow plow shaped V-blade pushing the brush. The upper knife edge and the plow operate indepenent of each other.

• •

¶ The Jaeger finisher which followed a Rex dual drum paver on this Merritt Parkway (Connecticut) job



vibrated the concrete as specified. Apparently, the engineers deemed additional edge vibration was necessary. The electric vibrator shown herewith was used along the forms. Power was generated by a small engine mounted on the finishing machine.

• •

¶ Type of cobble gutter built on Ohio highway. The stones project to act as velocity retards, I presume. The stones are embedded in concrete.

• •

¶ "For Auld Lang Syne"—these patriarchs are to be seen in the spacious yard of Gledhill Road Machinery Company just outside Galion,

INTERESTING AUTOMOTIVE DATE

In 1886 the first gasoline-propelled automobile was invented by Daimler and Benz of Germany.

American Road

WASHINGTON, D. C.

SAN FRANCISCO NAMED

Down the Road

By CHARLES M. UPHAM

Engineer-Director,
American Road Builders' Association, Washington, D. C.

ROADS AND RELIGION

Woman's three major interests, according to an old German proverb, are her children, her kitchen and her church. While modern civilization has considerably widened her horizons, these interests still remain supreme in the life of the typical American woman. Especially is this true of the small towns and rural communities where both men and women find their chief social and cultural life closely interwoven with their church.

The church gatherings in many areas form the top spot in the entertainment program for the entire year. The weekly meeting of the missionary society provides an ideal opportunity for the ladies of the community to get together for a needle-and-talk session. Chicken dinners in the church basement during the winter and ice cream socials and such on the church lawn during the summer bring the members of the congregation together at intervals throughout the year. Within the church are formed numerous clubs of men, women and children with study or recreation as their chief aim.

It is, of course, on Sunday that the church assumes its greatest importance. Sunday school for the children and morning and evening services for the adults play their part in keeping up a high standard for the moral and spiritual life of the community.

Because of the important part played by the church in rural American life, the fact that many of our citizens are unable to attend church because of bad roads becomes especially serious. Sixty per cent of the 32,000,000 farm people in the United States live on unimproved dirt roads which bad weather often makes completely impassable. This means that more than 16,000,000 Americans are unable to get to church during many months of the year.

What can be accomplished by a church congregation with the aid of good roads is effectively demonstrated by the activities of the Hollandale Baptist Church. Until recently, the rural life in that section in the heart of the Mississippi Delta had been the old southern plantation system with negroes farming the land and making up the bulk of the population. Within the past few years, however, a large number of white people have moved there to buy and develop the land reclaimed by the government drainage program. Since there were no churches for white people in the rural districts of that section, there was soon established a mission, a branch of the Hollandale Baptist Church, in a community 12 miles east of Hollandale. The mission church has since become a thriving organization with approximately half of the congregation dependent on buses for transportation to Sunday school and church. These buses, which are the same type as those used in carrying farm children to and from school, also serve to bring the congregation from the rural districts south, east and west of the town to the Hollandale Baptist Church.

"Good roads have been one of the greatest factors in the success of this work," writes Reverend E. L. Douglas, pastor of the Hollandale church. "Washington County, in which Hollandale is located, has a splendid road system. The main highways are paved, while the secondary roads are either gravelled or rock surfaced. Without this system of good roads it would be impossible for us to do what we are doing, since the nature of this delta soil is such that it is practically impossible to drive a heavily loaded bus over the native dirt roads when wet."

SAN FRANCISCO NAMED 1939 CONVENTION CITY

San Francisco has been selected by the Joint Exhibit Committee of the American Road Builders' Association as the location of the association's 1939 Convention. The Golden Gate was named the locale of next year's conclave at a recent meeting in the offices of Michigan State Highway Commissioner Murray D. Van Wagoner, A. R. B. A. president. February 15 to 18 were tentatively set as Convention dates. Charles M. Upham, A. R. B. A. engineer-director, was in California during the first week of this month making arrangements for the meeting.

1938 A.R.B.A. PROCEEDINGS ARE NOW AVAILABLE

The Proceedings of the 1938 Road Show and Convention of the American Road Builders' Association are now available for distribution to A.R.B.A. members. Complimentary copies of this 932-page volume, which contains all the papers and reports delivered during the sessions of the last Convention, will also be sent to all new members of the organization. This volume comprises a complete record of all developments in the highway profession and industry.

HIGHWAY HEADS OF TEXAS ARE WASHINGTON VISITORS

Among recent visitors to Washington were General Robert Lee Bobbitt, chairman of the Texas State Highway Department, and Julian Montgomery, state highway engineer. While in the nation's capital, they conferred with W. C. Markham, executive secretary, American Association of State Highway Officials, in connection with the highway officials' annual convention in Dallas, December 8 to 13. General Bobbitt will be among the principal speakers at the formal dedication of the new steel bridge over the Neches river at Port Arthur which is tentatively scheduled for September 7 and 8.

Builders' Review

AUGUST, 1938

JULY'S DISABILITY RECORD

Approximately one million people suffered disabling accidents last July —one out of every 130 persons in the United States.

1939 CONVENTION CITY

With Our State Groups

FLORIDA

An intensive study of Florida's highway system is being made by a joint committee of the state Senate and House of Representatives under the chairmanship of Arthur B. Hale, chairman of the state road department. A policy for future road construction and financing will probably be recommended by this committee which will study the results of experiments now being conducted to determine the most suitable kind of construction for state highways.

GEORGIA

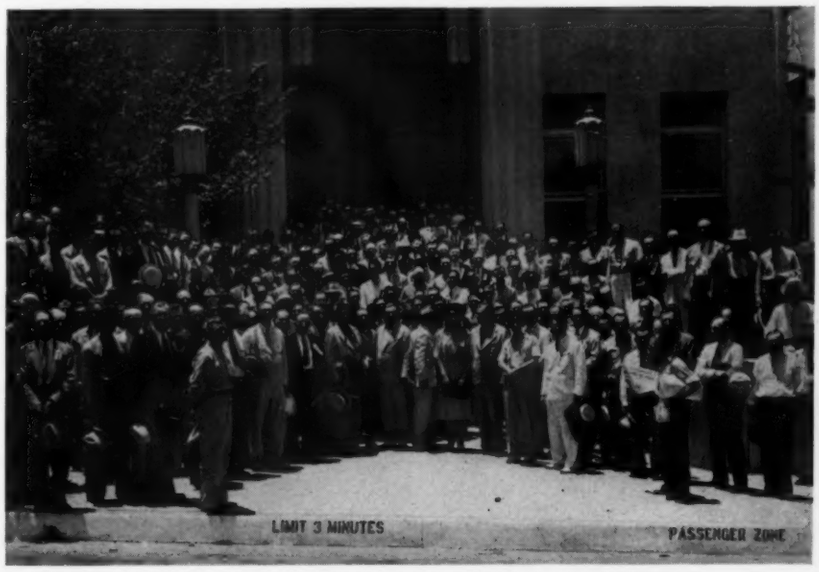
A Good Roads Meeting and "Highway Jamboree" will be held near Atlanta on September 29, 1938. Officials and engineers of the state highway department, county commissioners, officials of other branches of the state government, contractors, material men, equipment distributors, oil men and others interested in the construction and maintenance of roads will be invited. Members of the newly elected Georgia legislature will also be asked to participate. The primary purpose of the meeting will be the laying of a foundation on which will be constructed a constitutional amendment to prevent the future diversion of highway funds in Georgia.

NEW HAMPSHIRE

A highly successful meeting of the New Hampshire Good Roads Association was held recently at the Balsams hotel in Dixville Notch. A committee was appointed to take the necessary action to bring to public attention the necessity of ratification of the constitutional amendment to prohibit diversion of gasoline taxes and motor-vehicle registration fees to non-highway purposes which will be submitted to the voters of New Hampshire in the fall.

PENNSYLVANIA

A plan has been formulated by the Associated Pennsylvania Constructors, in co-operation with officials of the WPA and the Pennsylvania department of highways, for the utilization of WPA labor under the management of experienced and skillful contractors. Announcement has been made that some highways are to be bid shortly under a "management contract system." Under the new arrangement, the contractor will have an opportunity to bid on projects for which he will furnish supervision, skilled labor, equipment and its operators, tools and a large portion of the materials used, while the WPA will furnish all the common labor, probably a part of the semi-skilled labor and a small part of the materials for the project.



Members of what is claimed to be the largest delegation ever to appear before the Texas Highway Commission in behalf of any road project are shown above. Composed of more than 400 persons, the delegation attended the June hearing of the commission to urge the designation of a new shortline highway from Houston to Fort Worth by way of Mexia. Representatives from each of the eight counties along the proposed route of the highway were present and the group was headed by former Governor Hobby, chairman of the Houston Chamber of Commerce Highway Committee. The picture was taken at the main entrance to the State Highway Building, Austin, Texas.

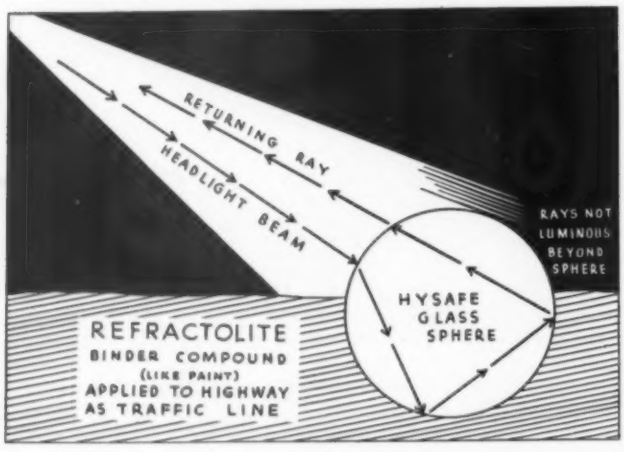
GUARD RAIL COMMITTEE REPORT READY FOR DISTRIBUTION

The report of the Problem Committee on Guard Rail of the A.R.B.A. Committee on Safe Highways has been published and is ready for release to the public. The report contains the results of the committee's research with recommendations for the construction and use of guard rail, along with examples and illustrations of same. Copies may be obtained by writing the American Road Builders' Association, 952 National Press Building, Washington, D. C.

SOME EFFORTS TO INCREASE SAFETY OF NIGHT DRIVING

In our efforts to promote safety on the highways we admit that traffic striping is a valuable accessory. It has been stated that the center line on a highway is truly a "life line." We wonder if Edward N. Hines, who invented it, realized, while he was alive, how widespread its use would become and of the future developments of refinement and utility through which it will pass. It is common knowledge that we fail to see the center line paint stripe when the headlight glare of an approaching vehicle strikes us. Most of us, under these conditions, follow one of two processes in passing the bright headlights approaching. Either we watch the right hand edge of the pavement or we try to gauge our position in passing by judging the distance we allow between our own vehicle and the approaching headlights. Both of these cases are unsatisfactory and in neither case are we able to see the painted center stripe. How many accidents are caused by this condition is not known. If only a few of them could be prevented the medium employed to bring about the reduction would be well worth while.

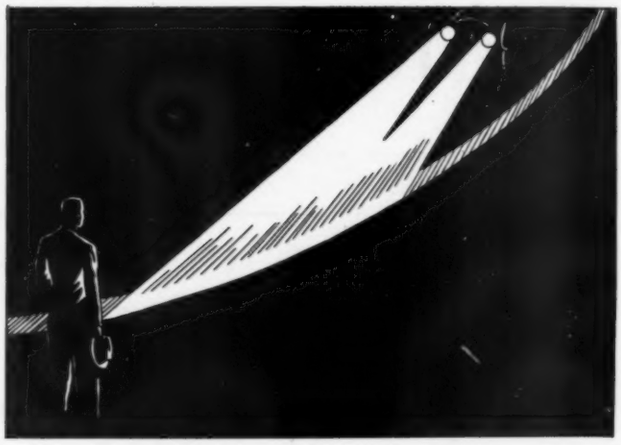
Glass Beads—The writer observed a series of experiments for making center stripes, side stripes, signs and markings self luminous. In the course of the experiments, many advantages were indicated by the process employed. The pavement center line stripe was



Path of Light Rays Through the Glass Beads and Returning to the Driver. This Schematic Diagram is Presented to Show the Theory of Returned Rays.

made, not of ordinary paint, but of a paint-like binder in which small glass beads were bound or embedded. When the headlight struck this center stripe it became pearly luminous to the driver Three facts about this stripe impressed the writer. The first was that the stripe was luminous for several hundred feet ahead. The second fact is that while the driver was sitting in the car and had his headlights burning the stripe was luminous to him, but when the driver got out of the car and looked at the stripe from a point down the road a piece facing his headlights, the stripe was not luminous. In other words, the beads apparently reflected light back to the driver and did not penetrate the bead.

The third and most interesting observation was that the stripe appeared more luminous when the lights of an oncoming vehicle was shining in the driver's eye than when no lights approached.



Your Own Headlights Make the Beaded Line Luminous Only to You, Not to Anyone Coming From the Opposite Direction Without a Light.

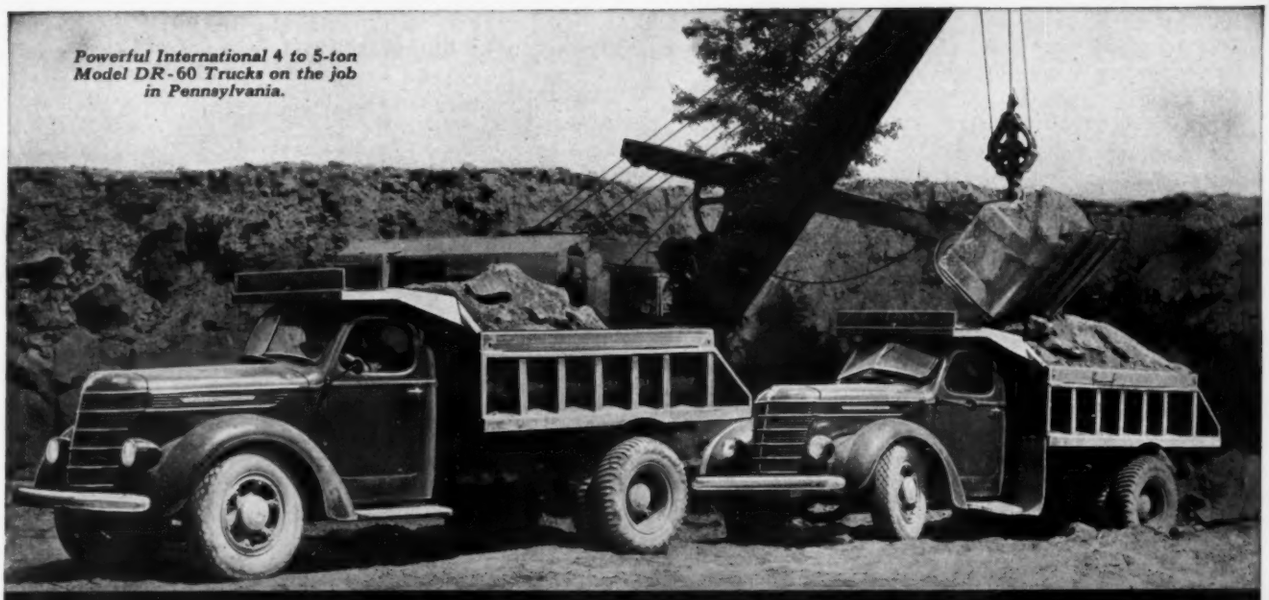
It was easy to see the beaded center stripe for a couple of hundred feet past the nearby approaching bright headlights. The reflected light takes its color from the color of the pigment in the binder.

Highway signs treated with the glass bead surfacing made the signs highly luminous from practically all angles throughout a 180-degree range. The night driver will appreciate this when he recalls that he is unable to read the average sign at just the moment he expects to read it. At this precise moment, usually, as he is traveling 50 or 60 miles an hour, the ordinary painted sign becomes a glare and nothing is readable.

Value—Night driving safety challenges the highway engineer. The observances recorded here were made when there was no rain or fog. What the glass beaded stripe may do under those conditions we have not observed. Certainly it cannot be worse than present practice.

Other Aids—The reflectorized button has served well to illuminate signs, to mark guard posts and obstructions in the right of way. They are valuable aids to the night driver. In places an individual button has been built into a metallic shell and set into the pavement on curves. It has been our experience that these center line light reflecting buttons have been placed too far apart to be a dependable aid. Then, too, snow plows

With Approaching Headlights Shining Directly in the Driver's Eyes the Beaded Line Appears More Luminous Than Before. Under These Conditions Oncoming Glare Is Not So Dangerous.



Powerful International 4 to 5-ton Model DR-60 Trucks on the job in Pennsylvania.

The Tougher the Job the Greater the Need *for* INTERNATIONALS

INTERNATIONAL TRUCKS long ago proved they can take a lot of punishment. The *quality* International Harvester builds into them shows up to the user's advantage in dump-truck and other tough work. The investment you make in Internationals *pays dividends* in economy of operation and maintenance, dependability, and long life. Time alone has not built the reputation and preference for these trucks—*performance per dollar* has been the answer. Today Harvester experience and high-grade workmanship are available in 30 models and 99 wheelbases—ranging in size from Half-Ton Pick-Up Trucks to powerful Six-Wheelers. Turn your hauling over to Internationals—select your trucks from this broad line and solve your hauling problems the most satisfactory way.

Concrete Delivery Co., Buffalo, uses 4 to 6-ton Model DR-70's for their hauling.

International Pick-Up Trucks are handy units for carrying light loads, tools, supplies, etc.

INTERNATIONAL HARVESTER COMPANY
(INCORPORATED)
180 North Michigan Avenue Chicago, Illinois

INTERNATIONAL TRUCKS

often jar them loose and they are lost, but where the buttons have been placed above the roadbed in signs, in panels on culvert or bridge headwalls which are close to the roadbed, or in designs for obstruction warnings, they have been particularly effective.

A recent development is a "fisheye" non-metallic disc. Three of these were placed in a vertical row touching each other (on the installation the writer noticed) in a head framing mounted on an iron pipe post about four feet above the shoulder of the road. Posts were about 250 or 300 ft. apart on both shoulders of the road. The reflectors showed brightly from returned headlight power and were visible a long ways ahead.

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New Lateral Earth Pressure Formula Advanced

Horizontal Pressures on Retaining Walls Due to Concentrated Surface Loads is the title of a new bulletin by M. G. Spangler, Iowa Engineering Experiment Station, Ames Iowa. Mr. Spangler submits the following abstract:

Retaining walls of various kinds, used to restrain earth masses against lateral flow, are among the commonest and oldest types of structures which engineers are called upon to design. The engineering literature is replete with theories and accounts of experiments relating to the overturning forces which the retained earth imposes against these structures. Meanwhile, there has been little study of the magnitude and distribution of overturning forces due to loads applied over limited areas on the backfill surface. Designers have had to be content to assume an equivalent uniformly distributed load or surcharge to substitute for the actual load situation.

The purpose of this research was to measure the magnitude and distribution of the horizontal forces transmitted to a retaining wall through a gravel backfill by a concentrated wheel load applied at the backfill surface and at various distances back of the wall. Also, measurements were made of the distribution of normal pressure due to a line load parallel to the wall, and a method proposed for determining the magnitude and distribution of horizontal presure due to an area load adjacent to the wall. A new hypothesis of horizontal pressures on retaining walls due to an earth backfill is suggested, based upon a consideration of the elastic solid characteristics of the fill.

Pressure measurements were made on actual retaining walls, 6 ft. high and 15 ft. long, by means of stainless-steel friction ribbons and Goldbeck pressure cells. A heavily loaded truck was used to apply the concentrated loads. The parallel line load was obtained by placing the two rear wheels of the truck on a heavy timber resting on the backfill surface parallel to the walls.

The measured pressures were found to be distributed in accordance with the Boussinesq law of distribution of a concentrated load through an elastic medium, but the magnitudes of the pressures were two to three times as great as those calculated by the classical Boussinesq equations. The greater divergence occurred when the loads were applied close to the retaining walls.

Considerably more research is needed to correlate the stress-distribution characteristics of various kinds of backfill materials with physical properties of the soil, and to determine the effect of the relative rigidity of the wall and backfill. Also, experimental evidence is needed to confirm or disprove the proposed theory for determining normal pressures due to area loads and surcharges, and to indicate the merit of the new hypothesis of horizontal pressures due to fill materials.

New Hypothesis of Lateral Earth Pressures.—In this research, remarkable qualitative resemblance was found between the horizontal pressure distribution caused by concentrated surface loads or line loads and the pressure distribution indicated by the classical Boussinesq equations for stress distribution in an elastic solid. This resemblance tempts the author to suggest that a new approach to the problem of retaining-wall pressures due to backfill materials might be made upon this same basis. In such an hypothesis, the weight of each small incremental volume of backfill material might be considered to be a concentrated load which would transmit a horizontal pressure to a retaining wall through the mass of fill material lying below the increment. The sum of the horizontal pressures due to all such increments of volume above any point on a retaining wall would be the pressure on the wall at that point.

The general form of a mathematical expression of this idea would be

$$h = K\, w \int_0^z \int_{-\infty}^{+\infty} \int^{\infty} \frac{\xi\, x^{(a-n)}}{(x^2+y^2+\xi^2)^{5/2}}\, dx\, dy\, d\xi \qquad (1)$$

in which

h = horizontal pressure on a retaining wall at any depth z below the surface, due to backfill material

w = unit weight of backfill material

ξ = vertical distance from an incremental volume of backfill down to the depth z.

For restricted volumes of backfill material other appropriate limits than those shown in equation 1 should be used. A consideration of this proposition indicates that the pressure on the wall may be affected by the distance which the backfill extends back of the wall to a much greater extent than is indicated by the orthodox wedge theories.

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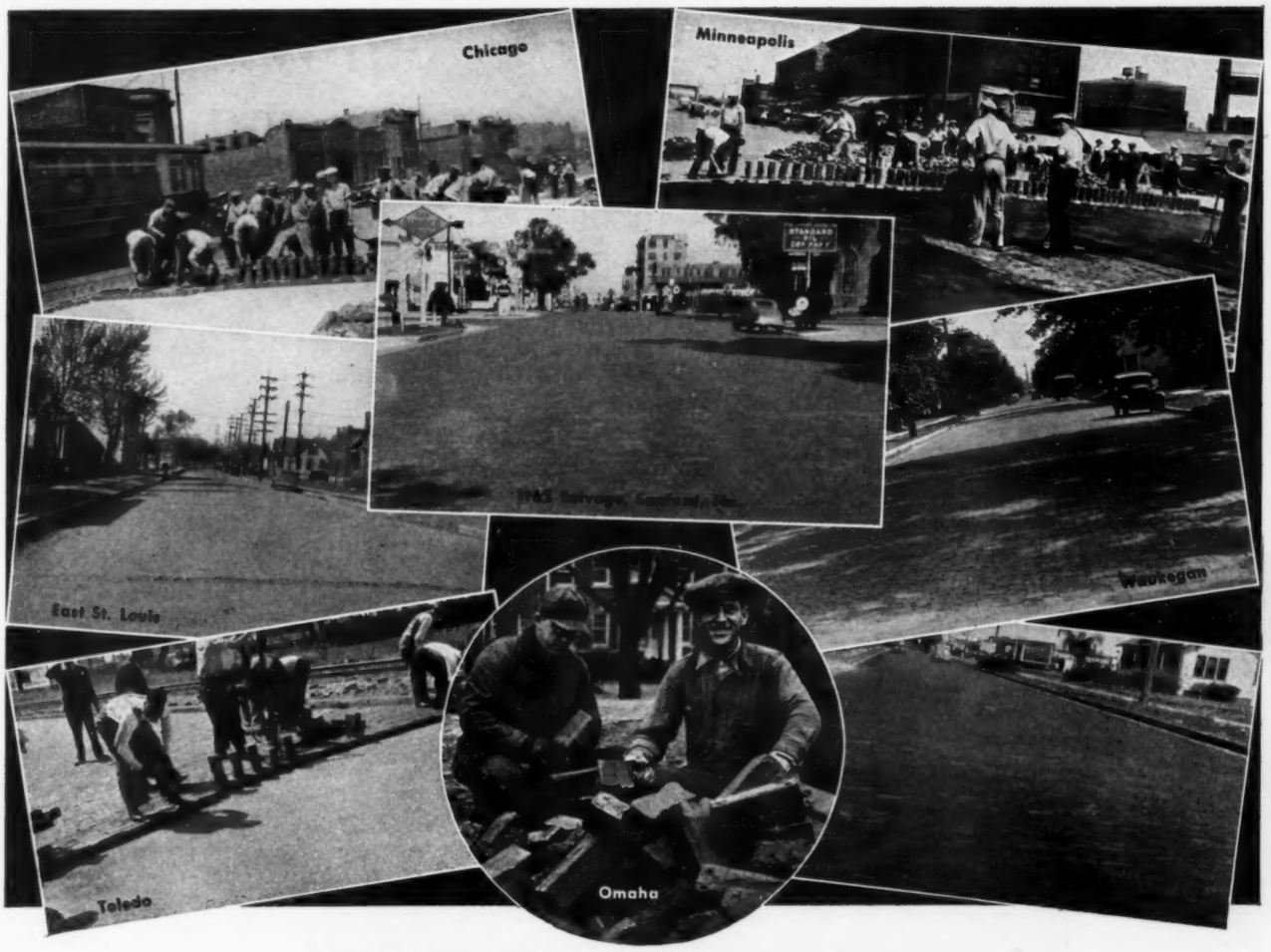
Safety Program Reduces Accidents

What a well-rounded safety program will do in reducing traffic accidents is shown by the following table, reproduced here from the report by Sidney J. Williams, Director Public Safety Relations, National Safety Council, presented at the 8th International Road Congress held at The Hague, June 19-July 2, 1938:

ACCIDENT RECORDS OF CITIES THAT APPLIED RECOMMENDED SAFETY PROGRAMS

City	Population	Average death rate 5 years ending 1931	Average death rate 5 years ending 1936	Per cent change
New York, N. Y....	6,930,400	16.4	13.7	—16.5
Baltimore, Md.	804,800	18.5	16.7	—9.7
Milwaukee, Wis.	578,200	17.2	12.1	—29.7
Rochester, N. Y.....	328,100	12.8	12.3	—3.9
Dallas, Tex.	260,500	21.2	16.4	—22.6
Providence, R. I.....	253,000	13.9	9.8	—29.5
Syracuse, N. Y.....	209,300	16.4	9.8	—40.2
Wilmington, Del.....	106,600	15.0	13.5	—10.0
Allentown, Pa.	92,600	14.5	14.1	—2.8
Evanston, Ill.	63,300	13.7	7.7	—43.8

Figures for cities which did not employ effective safety programs reveal much higher death rates, especially during the 5-year period ending with 1936. Not one of the cities listed above had a death rate as high as the average of all cities in its own population group.



SALVAGE

—*for taxpayers, a* "BONUS"; *for labor, a* "BREAK"

Brick pavements have an exclusive advantage of a broad economic nature. After long service, the brick units have high salvage value.

Salvaging and relaying old brick on their new base is rarely ever an emergency* matter from the traffic standpoint. And this flexibility as to *time* when the work may be done permits postponement from periods when labor is scarce to times when men need employment.

Thus, relaying does not compete with private employment in good times; it furnishes a backlog of needed hand-labor when labor must have employment.

In recent years the Works Progress Administration has utilized this work with splendid results. Salvage of 40-year brick has often run over 75%. Engineer Fred T. Williams reports 116% salvage at Sanford, Fla., where "on edge" brick were turned flatwise in the new pavement. WPA forces turned out a good job which should equal the service the 36-year brick had already rendered.

New or relaid, brick has the longest life and lowest upkeep. Safe. Pleasant to ride on. And the big salvage is a "bonus" to taxpayers and a "break" for labor. National Paving Brick Association, National Press Bldg., Washington, D. C.

**The Reason:* At any stage of service, brick resists damage from weather as well as traffic.

BRICK

LONGEST LIFE . . . LOWEST UPKEEP . . . GREATEST SALVAGE VALUE

SHORTEN THE LAG BETWEEN RESEARCH AND PRACTICE*

By FRANK T. SHEETS

President, Portland Cement Association, Chicago, Ill.

ONE OF the greatest ills of the engineering profession is the long lag between research and practice—the time elapsing between the discoveries and findings of research and their general acceptance and application by engineering practitioners.

The primary cause of this ill is lack of interpretation and lack of selling of the fruits of research.

As we cast about for a cure for this ill, it seems necessary that we bring to bear on the case:

(1) Frank analysis of the existing situation; (2) Correction of present evils; (3) Development of improved procedure.

As I approach the discussion of this subject and take upon myself the role of a doctor, prescribing for the ills of a patient, I resort to the doctor's prerogative of saying, "Do as I say, not as I do," because in my own experience in research and engineering practice I must plead guilty to many of the charges and many of the shortcomings which I shall herein discuss.

Further, I mean to be kindly, constructive, and impersonal. Sincerity should not give offense.

If we make a painstaking survey of current engineering practice, we are forced to admit that it lags away behind the knowledge which has been developed from research and scientific analysis. This applies generally throughout the entire field. Examples occur in the road field, in the structural field, and in many others. Building codes, for example, frequently prescribe narrow limits, within which the practitioner must prepare his designs, and yet many building codes are obsolete in the light of present day knowledge.

Practitioners

Before we can expect the findings of research to be adopted and made a part of current engineering practice, it is necessary that they be understood, absorbed, and molded into a form usable by the practitioner. Therefore, in taking up the challenge to shorten the lag between research and practice, it is reasonable that we look at the practitioners and see what manner of men comprise this group. Among them we find:

1. Busy executive, scientifically inclinded, open-minded, but too busy to delve into research details;
2. Busy executives, non-scientific in instinct, impatient of detail and given to direct action;
3. The closed-minded individuals, self-sufficient in their own knowledge, who are inclined to pooh-pooh any proposition, with which they are not acquainted, as abstract theory;
4. The so-called practical engineers, scoffing at any problem involving more than arithmetic and simple equations;
5. The know-it-alls;
6. The do-it-the-way-we-learned-in-school crowd;
7. The copy cat, tradition-loving, mentally lazy flock;
8. The very, very few who are just plain dumb;
9. The smart, open-minded searchers for better things.

To this composite and widely varying crew, the fruits of research must be interpreted and sold.

Research

As we approach the problem of interpreting and selling the fruits of research to the practitioner, it might be well to pause and consider—what is research? To my mind, it may be best defined as the honest, intelligent, painstaking search for useful truth. As such, it exists for the good it produces; and any activity carried on as mental gymnastics, for entertainment and pleasure alone, or for the personal aggrandizement of individuals, does not come within this definition and cannot be dignified by the name of research. In its highest sense, research is a sacred trust. It must be entrusted to those high-minded, self-sacrificing, conscientious individuals who will regard it as such, and who will realize their responsibility to their fellow members of the engineering profession.

Researchers

We have already discussed the complex group called practitioners. It is equally pertinent to take the researchers apart and see who they are. As we do so, we find that the researchers are made up of:

1. Inhabitants of the technical stratosphere—men who think so deeply in their particular field that rather complicated statements seem simple to them, and who are not conscious of being profound—"who could not if they would," talk the language of the practitioner;
2. Cloud riders—not quite so abstract or profound in their thinking and utterances as the stratospherists, but still difficult for the practitioner to follow;
3. Technical adventurers, engaging in research mainly for the fun of it, largely indifferent to responsibility of interpreting results and completing investigations, and constantly looking for new fields to conquer;
4. Technical snobs—thank heaven they are few—who like to talk a ten cent idea in ten dollar language, thus impressing the uninformed with their profound minds;
5. The self-advertisers, thinking of research primarily as a ladder to personal success;
6. The conscientious thinkers;
7. The unselfish servers of fellow engineers;
8. The rare species, who simultaneously contribute unselfishly, think deeply, conclude soundly, talk simply.

With these complex and violent contrasts in the personnel composing the groups of researchers and practitioners, it is no wonder that there is a lag between research and practice, and that a studied effort must be made by both groups to facilitate molding research into practice.

With this problem before us, a good dose of frank self-analysis will be most helpful. There is a lot of good and little of bad in each of us. Let us strive to eliminate the faults that are keeping researchers and practitioners so far apart, and let each individual in the two groups tune his thinking and his actions to the obvious needs of his fellow engineers.

*An address presented at the 34th Annual Dinner of the American Concrete Institute, Feb. 23, 1938, and printed in the May-June Journal of the Institute.

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Research Reports

These preliminary discussions bring us to a consideration of research reports as they are prepared today. Generally speaking, they are written primarily for the consumption of researchers, rather than practitioners.

They frequently require the reader of the report to know as much about the research problem and the work as the writer himself, in order to gain a clear understanding of what the writer really means. They are not directed at the ultimate consumer.

The make-up commonly used consists of: a statement of the problem; a description of the apparatus; discussions of the details of the method of making tests and measurements; a complete presentation of the data secured; a summary of the findings; the conclusions.

The sad part is that frequently these component parts of research reports are badly jumbled together in writing, so that it is difficult for the uninformed or busy reader to segregate the information in which he is primarily interested.

Obviously, fellow researchers want all of these component parts of a research report to be clearly and separately stated, but the practitioner (believing in the researcher's integrity and ability) wants primarily: a statement of the problem; a presentation of essential findings of fact; the conclusions from the facts, stated in such a way that they may be applied to practice.

Therefore I present this question: "Why not write all research reports from the practitioners' point of view?" This would mean incorporating in the body of the report a statement of the problem, the essential findings of fact and conclusions for embodiment in practice—putting in an appendix or supplement the other information which fellow researchers would find interesting and helpful in analyzing the researcher's report, such as: a description of the apparatus; the details of tests and measurements; the data secured. It might be best in many instances not to publish such a supplement as a part of the report, but merely to refer to it as being available, on request, to those who require such supporting detail.

This course is suggested, not with the idea that it is not absolutely essential to record permanently and state clearly information of the type which would be included in a supplement of this character; but rather to emphasize that part of the research report which is essential for the practitioner, to strip research reports down to these bare essentials and thus to challenge the busy practitioner to read and apply useful truth.

Interpreters

However, in spite of the benefits which would follow such reforms in report writing, the fact remains that in many cases after the researcher has gone as far as he can toward grasping the need of the practitioner and presenting his findings from that point of view, and after the practitioner has gone as far as he can in entering the realm of the researcher, there still remains a "No-Man's Land," a missing link between research and practice. In such case, we badly need an interpreter.

This would be an engineer who is fully competent, from the standpoint of training and mental capacity, to grasp the finding of the researcher, and who at the same time has a background of practice and a knowledge of the practitioner's needs. This ability would enable him to analyze and assimilate the researcher's findings and state them in language which the average practitioner can comprehend.

An alternative would be a joint committee of researchers and practitioners, who will review a research report before its release, to insure that the statements are not only sound from the research point of view but understandable and in form for application by the practitioner.

An outstandingly good example of the type of interpretation we have in mind consists of the textbook writers and engineering teachers. Here we have men who are forced frequently to take complicated technical information, obtained through profound research, and interpret it in such a way that it may be grasped by young engineering students, the average of whom have no higher mental qualifications than the average of the practitioners, and who lack the background of experience which the practitioner has.

All researchers and practitioners were once engineering students, and none of us can fail to remember how we blessed the outstanding textbook writers and outstanding teachers, who presented their material understandably. If we had not had good interpreters in our younger student days, many of us would not be engineers now, and with this fine record of the fruits of good interpretation, it seems distressing that we have not more generously employed the interpreter in our more mature technical experience to keep practice abreast of research.

"There Ought to Be a Law"

In our civic experience whenever we encounter a distressing condition, the first cry is for legislative reform. And so, as I contemplate this problem, I am tempted to say "There ought to be a law" providing that

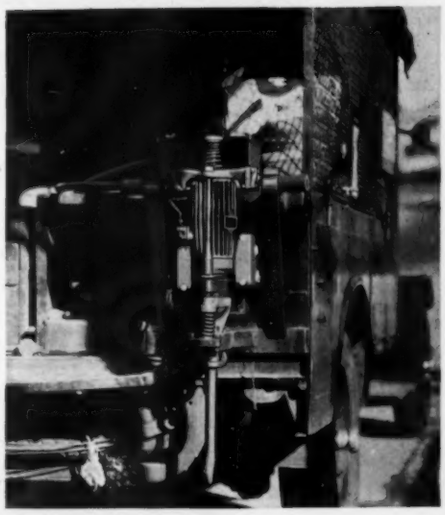
1. All researchers must try to determine what the problem is before they start to solve it;
2. All researchers must analyze results and prepare an understandable report on completed projects before new ones can be started;
3. All the profound shall try to be simple, and the simple to be profound;
4. A practitioner shall be outlawed if he doesn't keep up with research and apply it;
5. The researcher shall be ostracized by his fellows if he forgets the need of the practitioner or indulges in technical snobbery;
6. Interpreters shall be born, trained, used and honored;
7. All must search for, recognize and apply scientific truth;
8. All researchers must recognize that the intelligence quotient rating of practitioners as a body is probably reasonably near that of the researchers as a body; that merely because the practitioners haven't time to be as familiar with research as the researchers, and are too busy to delve into involved, verbose and abstract reports, they are not dumb; and that the practitioner is too busy being a practitioner to be necessarily a good researcher.

American Concrete Institute

As I survey the concrete engineering field, I can't help concluding that there is no single body better fitted to take up the challenge—"Shorten the Lag Between Research and Practice"—than the American Concrete Institute. It's membership is made up of researchers and practitioners. As this organization comes to recognize fully its responsibility and opportunity, it should provide the common meeting place for the researcher, the interpreter, the teacher, the designer, the construction engineer, the builder, the materials producer, and its meetings should provide:

Combined sessions, interesting to all
Group sessions, designed for each

Saves Time and Money The Year' Round



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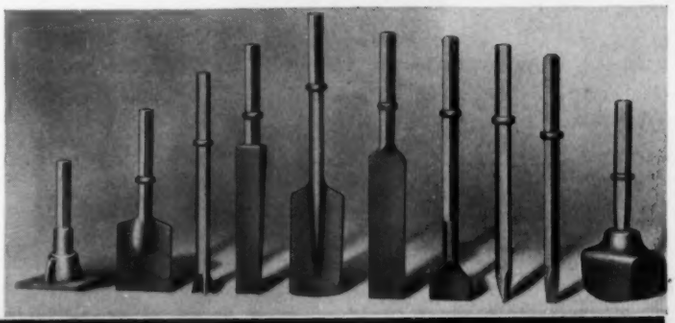

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Common understanding among all component parts of the concrete industry

A forum for all

A challenging Journal, research reporting service and information exchange, indispensable to all.

If the Institute did these things, the tens in attendance would become hundreds; the hundreds would become thousands, and membership would be legion.

I cannot close without inviting the American Concrete Institute to accept this challenge and to take as its slogan:

A. *All inclusive*
C. *Concrete*
I. *Interpretation*

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Gasoline Tax Receipts Increase Over $70,578,000 in 1937

Gasoline taxes, inspection fees and similar receipts—resulting from gasoline tax laws in the various states—yielded a net revenue of $761,998,000 in 1937, according to reports of state authorities to the Bureau of Public Roads of the U. S. Department of Agriculture. Similar receipts in 1936 totaled $691,420,000. Consumption of gasoline on highways amounted to over 19 billion gallons and increased 7.6 per cent over the preceding year. Increases are reported in every state except Nebraska and Tennessee.

During the year four states increased the rate of tax by one cent with the result that the average rate for the United States rose from 3.85 cents in 1936 to 3.91 cents in 1937. Rates of tax ranged from 2c in the District of Columbia and Missouri to 7c in Florida, Louisiana and Tennessee. The rate of tax does not appear to seriously influence consumption since for the last two years the greatest percentage increases have all been in states with tax rates above the average, with two exceptions. In 1937 twelve states had increases of over 10 per cent, and in ten of them the tax rate ranged from 4 to 7 cents.

Refunds for non-highway or public use amounted to $43,210,000, an increase of six million dollars over 1936. In addition 650 million gallons were exempted from tax.

The table shows tax collections by states:

RECEIPTS IN 1937 FROM GASOLINE TAX

State	Tax at End of Year Cents Per Gallon	Gallons Taxed for Highway Use	Net Total Receipts
Alabama	6	210,673,000	$ 13,350,000
Arizona	5	86,396,000	4,333,000
Arkansas	6½	149,880,000	9,962,000
California	3	1,561,258,000	46,624,000
Colorado	4	184,801,000	7,431,000
Connecticut	3	313,528,000	9,496,000
Delaware	4	50,878,000	2,034,000
Florida	7	302,640,000	22,466,000
Georgia	6	308,681,000	19,550,000
Idaho	5	80,570,000	4,037,000
Illinois	3	1,217,974,000	36,266,000
Indiana	4	570,186,000	23,497,000
Iowa	3	429,590,000	13,047,000
Kansas	3	333,498,000	10,236,000
Kentucky	5	238,940,000	12,671,000
Louisiana	7	221,204,000	16,000,000
Maine	4	137,649,000	5,550,000
Maryland	4	248,128,000	9,857,000
Massachusetts	3	664,561,000	19,836,000
Michigan	3	972,939,000	29,430,000
Minnesota	4	433,143,000	15,493,000
Mississippi	6	167,175,000	10,222,000
Missouri	2	566,614,000	11,217,000
Montana	5	90,983,000	4,581,000
Nebraska	5	199,329,000	11,030,000
Nevada	4	30,203,000	1,177,000
New Hampshire	4	82,807,000	3,286,000
New Jersey	3	761,641,000	21,593,000
New Mexico	5	79,800,000	4,022,000
New York	4	1,702,621,000	61,915,000
North Carolina	6	373,317,000	23,393,000
North Dakota	3	88,647,000	2,935,000
Ohio	4	1,167,989,000	46,538,000
Oklahoma	4	344,027,000	13,772,000
Oregon	5	196,127,000	9,801,000
Pennsylvania	4	1,353,491,000	55,720,000
Rhode Island	3	118,644,000	3,094,000
South Carolina	6	173,360,000	11,135,000
South Dakota	4	97,347,000	4,155,000
Tennessee	7	237,540,000	18,938,000
Texas	4	1,041,463,000	41,678,000
Utah	4	75,720,000	3,424,000
Vermont	4	61,887,000	2,323,000
Virginia	5	322,667,000	16,122,000
Washington	5	305,082,000	15,282,000
West Virginia	5	192,079,000	8,496,000
Wisconsin	4	484,315,000	19,751,000
Wyoming	4	55,049,000	2,500,000
District of Columbia	2	131,080,000	2,732,000
Total		19,218,121,000	$761,998,000
Weighted Average Rate for Year	3.91c		

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Highway Routes in Indiana Cities Are Now Part of State Road System

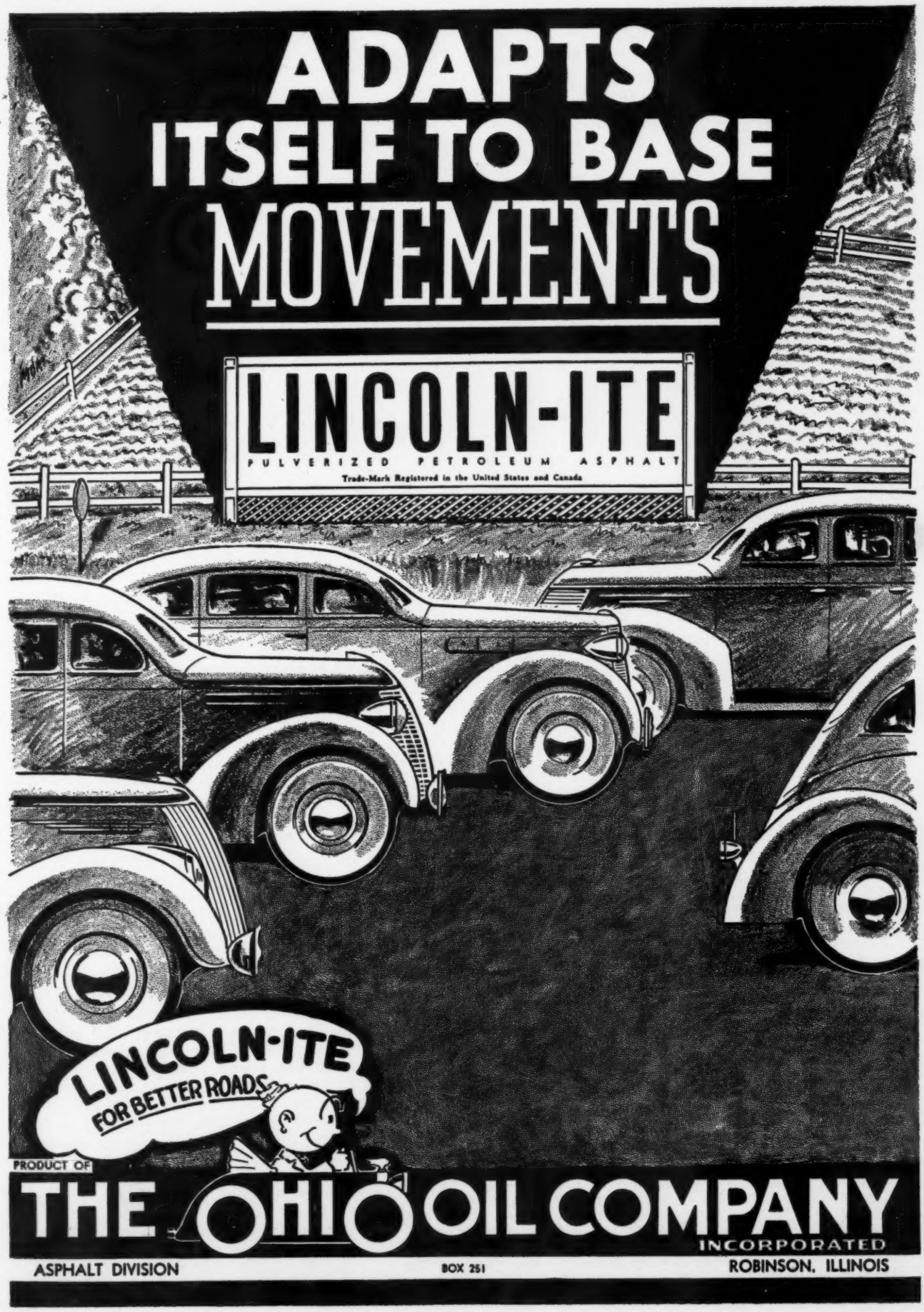
Routes of state highways in Indiana cities (with the exception of Indianapolis) and now a part of the state highway system with their maintenance and improvement to be financed with state highway funds.

Acting under a law passed by the legislature in 1937, the Highway Commission has cooperated with city officials in each of the municipalities affected, selecting the best route from the standpoint of local as well as through traffic convenience and safety. In taking over control of these routes, the commission plans no wholesale changes in traffic control although changes will be made as surveys indicate the possibility of greater safety and more uniform regulation of traffic in the various cities.

Back of the enactment of this law, Highway Commissioner Earl Crawford explains, was an attempt to give residents of the cities the same advantage which had previously been limited to the rural areas—maintenance and improvement of state highway routes from state highway rather than local tax funds of the highway commission could not be expended for improvement of a street in cities of over 3,500 population, although state highway traffic routed over that street was largely responsible for its condition.

Under the authority of the 1937 law, the highway commission becomes responsible for the maintenance, construction and reconstruction of streets over which state highways are routed, as well as regulation of traffic and parking on such streets. Maintenance has been defined as meaning repair, cleaning, snow removal and the control and maintenance of signs and signals.

Among provisions of the law regarding the selection, change and maintenance of state highway routes in cities other than Indianapolis, are restrictions of 56 feet on the surface that can be taken over by the commission, requirements that areas in the street occupied by car tracks shall be maintained by the street railway company; that the city shall provide right-of-way, maintain sidewalks, curbs and grass plots and shall provide for drainage and sanitary sewers; that permission to cut into streets and for driveways shall be obtained from the commission.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SOIL STABILIZATION

Short Course

A CORRECTION

On the bottom of page 35, and top of page 36 of the May issue installament of the Soil Stabilization series is the following:

"Vertical Pressure—Friction, Cohesion—From the plat, Fig. 17, we note that the logarithms of the cohesion and the internal friction are proportional to the logarithms of the vertical pressure."

Explanation.—Mr. C. A. Hogentogler, Jr., who prepared this part of the manuscript, in reply to a clarification of this point, when it was questioned by Mr. R. G. Vedeler of Natick, Mass., wrote as follows:

"In reference to Fig. 17, at first glance this certainly seems to be a direct contradiction of a fundamental conception of soil mechanics. However, it is really an error in nomenclature.

"It is, of course, generally thought that cohesion is independent of vertical pressure, but, it is probable that this should be modified with the restriction that the moisture content remain constant. This is very obvious if we consider the isolated cases of a soil in the liquid state and in the partially dry or semi-solid state. In the liquid state the moisture films are very large and exist practically as free water, having low cohesion, whereas, in the drier states the moisture films are thinner and more viscous and, consequently, the cohesive forces are very great.

"If our shear test apparatus is fitted with porous stones or

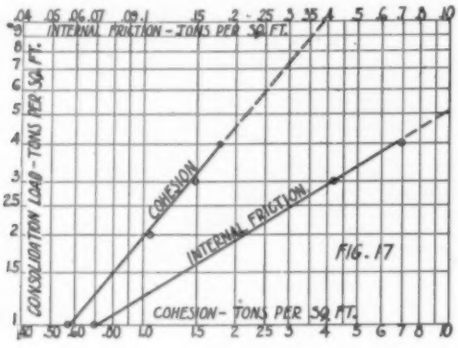

INTERNAL FRICTION - TONS PER SQ FT.
CONSOLIDATION LOAD - TONS PER SQ FT.
COHESION
INTERNAL FRICTION
FIG. 17
COHESION - TONS PER SQ FT.

Fig. 17

if the samples are prepared in a consolidation apparatus it is possible to prepare different samples of the same material by placing the sample in preparation device in the liquid state and then squeezing the water out under different loads or vertical pressures.

"It is thought, then, that the cohesion of each of the samples will vary as the logarithms of the pressures under which they have been consolidated, not the ordinary vertical pressures applied in the shear test in which the moisture is not changed."

From this letter it is apparent that Fig. 17 and the text as it appeared in the May issue should be changed as follows:

"Consolidation Load-Friction, Cohesion—From the plat, Fig. 17, we note that the logarithms of the cohesion, and the internal friction are proportional to the logarithms of the consolidation load."

Mr. Vedeler brought up another question regarding cohesion of a soil that would exist under certain loading conditions. Mr. Hogentogler, Jr., replied to the question as follows:

"It is my opinion but one that may be open to severe criticism that a soil in the saturated state does not possess cohesion and this property only appears when the moisture films are 'stretched' as in the shear test procedure. This is, of course, just an opinion but one that could be checked by making a shear test on a specimen completely immersed in water. If the cohesion proved to be zero this opinion would be substantiated."

In a subject which is developing so rapidly it is possible only to give opinions where there is a lack of data, especially as concerns the subject of cohesion.

BOOK REVIEWS

"Roads, Canals and Embankments with Caterpillar," by F. H. Nikirk for Caterpillar Tractor Co., Peoria, Ill. Paper cover, 182 pages, 6 in. by 9 in. Fully illustrated. Published by the Caterpillar Tractor Co. Price 50 cents.

It is the construction phase of roads by the use of Caterpillar equipment that is discussed by Mr. Nikirk. He has injected some of the engineering requirements but has excellently made the explanations in a non-technical way. The text covers (1) Factors Determining Road Construction Standards, (2) Road Construction (3) Road Improvement, (4) Paving and Road Surfacing, (5) Road Maintenance, (6) Building Canals with Blade Graders, (7) Building Canals with Elevating Graders, (8) Canal Maintenance, (9) Embankments, (10) Terracing as a Means of Soil Erosion Control, (11) Selection of Equipment.

"Good Low-Cost Roads," by Allis-Chalmers Mfg. Co., West Allis, Wis. Paper cover, 34 pages, 6 in. by 9 in. Fully illustrated. Published by Allis-Chalmers Mfg. Co. No price mentioned.

Various kinds of low-cost road work are explained in a non-technical manner. The book cannot be used by engineers for designing or preparing specifications. It is written more for the layman than the technical constructor or engineer. This was done purposely to give the county commissioner, business man or farmer, a working acquaintance with the subject of low-cost roads.

Illustrations, diagrams and tables are included to clarify the discussion.

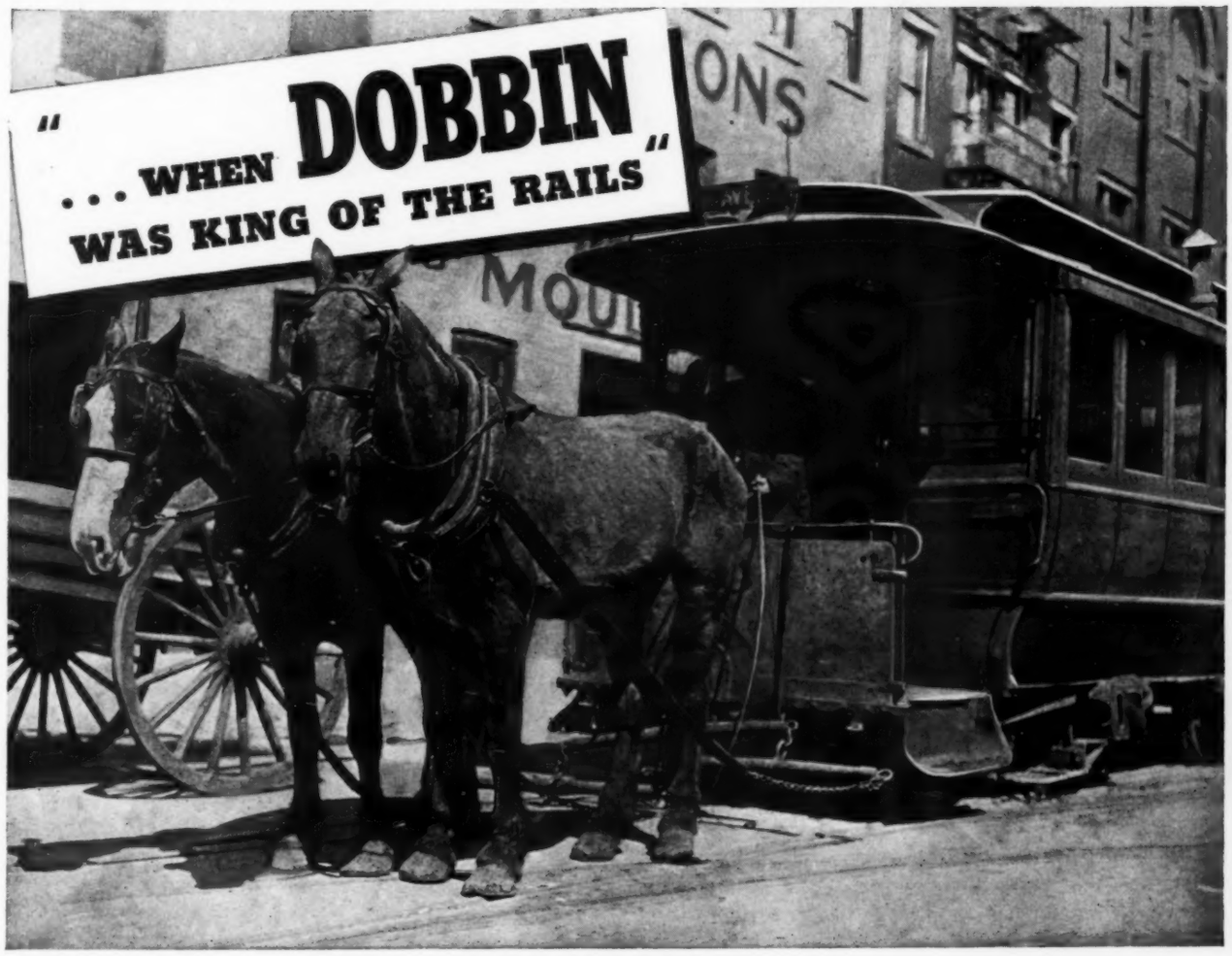
1937 Proceedings, Highway Research Board, by the National Research Council, Washington, D. C. Page size, 6½ in. by 9½ in., 534 pages, illustrated. Cloth hard binding.

Too often the efforts and work of specialists in a field are published as a report and then filed away on a shelf. It is the purpose of the Highway Research Board Proceedings to make highway research information more useful and more ready available by printing the reports in book form. All phases of highway engineering are covered by the detailed reports contained in this volume. It is impossible to state which of the reports are particularly important because I believe all are such. The work on Highway Accounting and that on Vehicle Operating Costs, when completed and the former adopted by highway organizations will provide much needed information. The same, however, might be said of all of the investigations.

Reinforced Concrete Pavement, by Royall D. Bradbury, Engineer-Director, Wire Reinforcement Institute. 189 pp., 6 in. by 9 in., flexible binding. Published by the Wire Reinforcement Institute, Washington, D. C.

The scope of this volume is limited to certain phases of highway engineering which involve the structural design and analysis of concrete pavements and pavement bases. Such topics as the selection, preparation, and properties of materials are not included, except in so far as they affect the selection of appropriate allowable or working unit stress. The principles and practices pertaining to construction methods are generally omitted, although a short chapter is devoted to the installation of sheet-type reinforcement.

In developing the theoretical background of the subject, the application of rational stress determinations to the structural analysis of concrete pavements is emphasized, not because of implicit confidence in actual stress-value exactness, but more as a useful analytical tool for consistently appraising the comparative merits of slab thickness, joint spacing, reinforcement, and other features affecting structural strength.



PAVING problems were comparatively simple when Dobbin was King of the Rails. Today's traffic conditions, however, present a far more complex problem to the highway engineer.

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- ☐ **GENASCO BLOCK AND JOINT FILLER** — For brick, granite block and concrete highways.

EDITORIAL

Bonus for Speed

JUST as authority must be an integral, inseparable part of responsibility, so should a bonus or extra compensation be an integral, inseparable part of "above-normal" effort. Recognition of this principle by the administrator of the Public Works Administration is gratifying and commendatory. The PWA recently established a "premium" policy for speed by local bodies.

These so-called "premiums" are additional payments by cities to their architects and engineers engaged in work preliminary to construction as reimbursement for extraordinary expenses which they may incur in hiring additional help, working overtime, and taking other steps which will effectuate any early start.

The administrator's order specifies that all PWA applicants who have entered, or who are about to enter, into architectural or engineering contracts be advised that the PWA will look with favor on the inclusion in such contracts of provisions for additional payments on a sliding scale to architects and engineers who actually effectuate an early start of construction.

Under the Public Works Act of 1938, construction on all non-Federal projects must begin by January 1, and in each "offer" which the PWA makes to applicants for whom allotments have been approved, a definite date for the commencement of construction is specified. PWA recognizes the fact that architects and engineers who prepare the project plans are in a key position to hasten the construction date.

By way of explanation, an "offer" is evidence of contract between the PWA and the local political subdivision, in the nature of a letter stating in dollars and cents just what the PWA will do financially in regard to the local project. When accepted by the local body it becomes the contract.

Contract provisions on expediting costs, which vary between 5 and 10 per cent of construction costs, between the applicant and the architect or engineer, must be mutually agreeable and approved by the PWA regional director. Such provisions will not apply to services rendered by the applicant's regular officers or employees. Within these limits, however, additional expenses for the purpose of speeding up plans and specifications on PWA non-federal projects by the architect or engineer will be regarded as a proper item of project cost on which a grant will apply. In other words, PWA will bear 45 per cent of the architect's or engineer's extra expenses under the limitations of the sliding scale when the start of construction is actually expedited.

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Common Understanding

SAID Mr. Don Lee of Texas at the 1937 meeting of the Montana National Bituminous Conference:

"I find that, in either discussion or reading articles, it takes about a tenth of your time to determine when you are talking about the same thing because of the lack of standardization of terms. You go into an article and it takes considerable time to get on common footing to find out if you are talking about the same thing but using different terms. If a movement would be started which would standardize terms, or if a movement could be started which would standardize our terms, I think it would simplify future articles."

This was part of a round table discussion at the Conference on the Development of a Bituminous Bibliography at the convention. Mr. R. N. Traxler, the Barber Asphalt Company, Maurer, N. J., was chairman. Said J. E. Buchanan, Research Engineer, The Asphalt Institute, San Francisco, Calif., in his paper at the same convention, "The terminology of bituminous construction is indeed confusing and the need for standardized terminology is very apparent when one is concerned with a review of technical papers. . . ." At the time the above pronouncements were made, Vic Brown of ROADS AND STREETS and Delmar Runner of the U. S. Bureau of Public Roads were engaged in the collection and editing of technical terms that had been approved and adopted by various associations. They have since published their work as a book entitled "ENGINEERING TERMINOLOGY, Definitions of Technical Words and Phrases."

The authors volunteer to act as committee members on any technical association or society committee dealing with standardization of technical terminology because they fully realize the necessity for having a common understanding of the meaning of a term or phrase. They offer their book as the framework into which to build additional words and phrases. Let the book be the structure into which to incorporate terminology of the various technical organizations. It is only by commercializing the efforts of committees in this respect that widespread distribution of standardized, accepted and approved definitions can be attained. By cooperating with various committees on terminology and nomenclature, a substantial coverage of the engineering field may be realized and definite conceptions of standardized terms transmitted into the various engineering fields.

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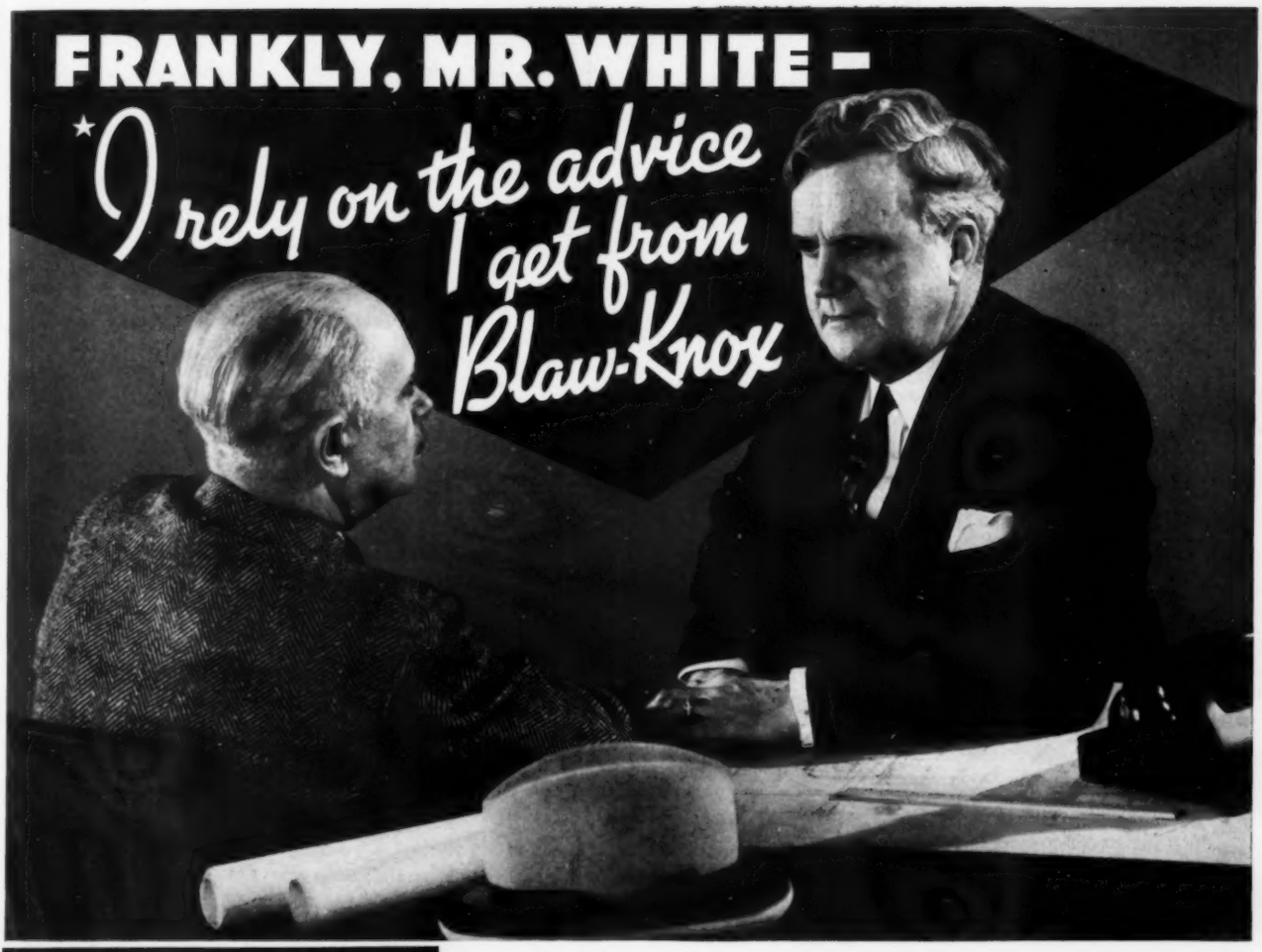
Persona Non Grata

COMES news of an action very gratifying in its nature. The action followed suspension by Administrator Ickes (P.W.A.) of an application from the city of Riverside, Calif., after it was shown that a certain Glenn E. Miller had been paid $1,000 by the city for alleged services regarding their application for a P.W.A. project. The action was the issuance of an order establishing a "persona non grata" policy by the administrator of P.W.A. Mr. Glenn is a charter member of what may turn out to be a large "persona non grata association."

Politicking and lobbying for public works project funds is an insult to the administration of this wholly worthy federal aid of public works. It so happened that the project was not road or street work. If a vicious, money sucking habit of lobbying were permitted there is no telling how corrupt men might become with O.P.M. (other people's money). We commend the administrator on his "persona non grata" policy.



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Don't Overlook New PWA Funds and Favorable Terms

ARE you aware of the liberal terms and the very simple procedure provided in the revised PWA program as a result of relief legislation passed by Congress in May? We ask because we understand the present possibilities are being largely overlooked, and because they will be lost unless acted on quickly. The program involves nearly one billion dollars for public works, including city, township, county and state roads.

The situation has been sensed very clearly by the executives of the Illinois Road Builders Association, and presented in a special bulletin under date of July 30, from which we quote at length.

"This bulletin is the result of a quick survey made throughout the state which indicated that . . . very few governmental units have made application for these gratuitous public grants of money for the construction and reconstruction of roads and bridges.

"We believe that if it were definitely known that every highway project which is now being planned could be increased by 90 per cent, that every official would unquestionably endorse the idea and approve application for this additional PWA money. In other words, if highway officials propose spending $5500 on a road project or projects, application can be made to PWA officials for an additional $4500, which would be granted to them without any restrictions that would in any way impose hardship, unreasonable costly imposition on the applicant. The Government only requires that the project, whether bituminous treatment, paving, graveling, grading, or erection of bridges and culverts be 'identified as project,' and that some preliminary sketch plan and estimate be submitted with the application. Secondly, satisfy the Federal Government that the applicant has the money to pay 55 per cent of the total cost of the project or projects. Thirdly, that the work be let to the lowest qualified bidder. Fourthly, that labor be paid the prevailing wage scale.

"PWA officials interpret the 'prevailing wage scale' as the wage that is now being paid by the local authorities, providing, however, that the scale is a reasonable living wage. PWA officials *have not established a wage scale,* either by zones or on any other basis. We wish to emphasize that the object of the 1938 Relief Act is *'to create employment quickly.'*

"In view of the fact that (1) investigation reveals neither restrictions nor arbitrary rules or regulations which will work a hardship upon any unit of government; (2) that the Illinois tax payers are entitled to the advantage of these Federal Grants; (3) that the work is not to be planned or supervised by outside agencies; (4) that it will create employment for great numbers of men now unemployed or on relief; (5) that it will bring hundreds of thousands of dollars in Illinois to be circularized to improve economic conditions generally; and (6) that it will improve streets, bridges and highways, including feeder and farm to market roads, which have been so greatly neglected because of lack of funds, we sincerely believe that every governmental official and civic minded person should do everything in his power to devise the means whereby Illinois can have the advantages of road improvements offered by the United States Government through PWA."

"Inasmuch as time is one of the most important elements, the Federal Government has established the following requirements:

1. Applications for PWA funds must be made on or before September 30, 1938.
2. Projects must be under construction before January 1, 1939.
3. Projects must be completed before July 1, 1940.

"Speed is of the essence. In order to take advantage of these funds, it is urged that all Governmental units make haste because of the shortness of time."

Full information as to terms and requirements may be had from any Regional Director, Federal Emergency Administration of Public Works.

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How Much Do Machine Shutdowns Cost?

WE can answer this question with the old bromide, "It isn't the original cost, it's the upkeep." The original cost involved in the shutdown may be 25 cents to replace a sheared bolt, but maintaining the shutdown until a replacement for that bolt is put in may send the figure up a lot higher.

We'll say this bolt failed on a power shovel. And that the nearest town, five miles away, has a hardware store that just fails to have such a bolt anywhere on the premises. And that it takes half a day to rustle up a bolt elsewhere in the countryside. During which half day the drivers of a string of trucks have been picking daisies on the company's time.

Or it was the hoist line on the shovel that gave up the ghost. Still bad enough. A $35 piece of wire rope holding up $15,000 worth of shovel, $35,000 worth of trucks—and $75 worth of payroll, which last is a clear loss. That's to say nothing about disruption of schedules and interference with other operations.

Equipment will wear out, will break—and the unexpected may always be expected to happen. But good management can usually reduce the extent of the loss when these inevitable shutdowns occur. There will always be some "upkeep" to them as well as some first cost. In many cases that "upkeep" can be held down by provisions for ready repair and replacements.

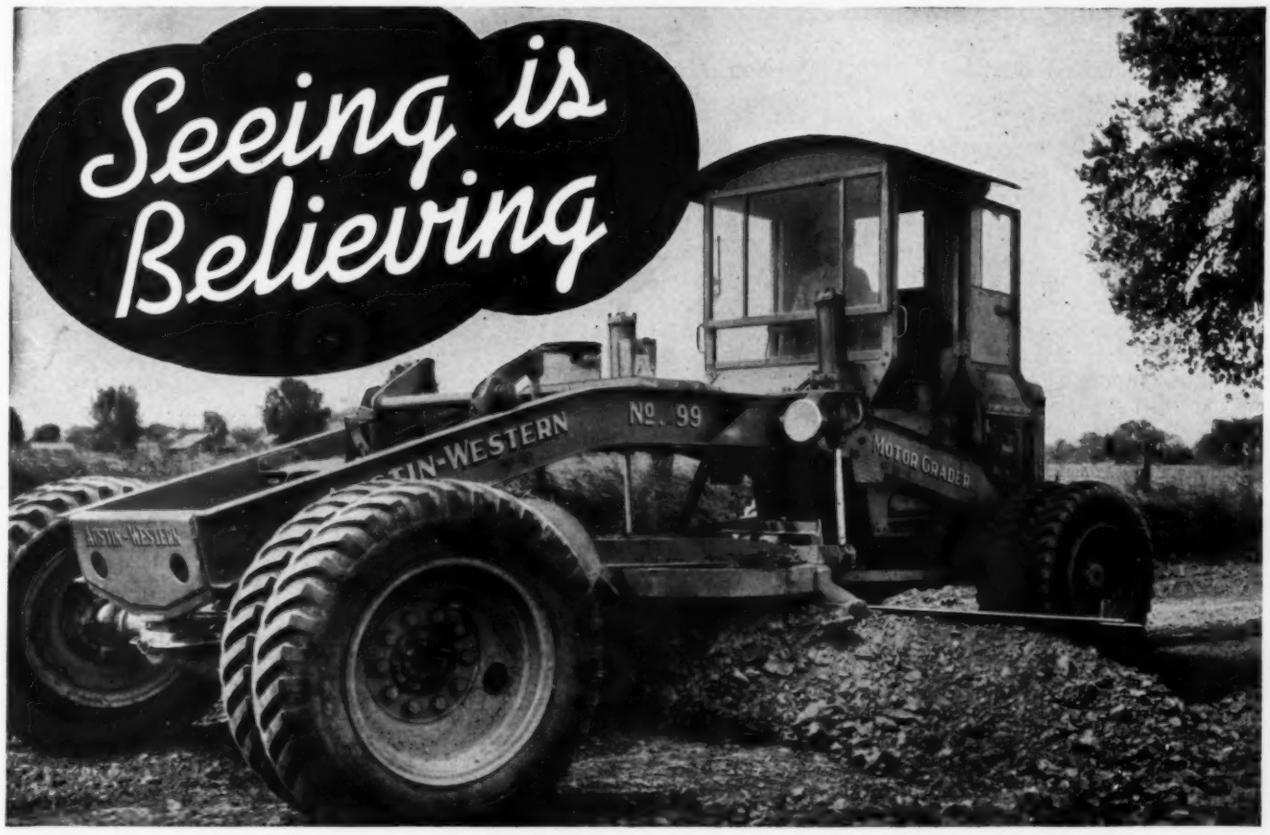
Certain pieces of equipment, wire rope for example, can be expected to wear out periodically. Also it can be expected that accidents will put this equipment out of commission unexpectedly, from time to time. Naturally, the thing to do is to have a replacement rope handy—so that it can be reeved without delay. If the shovel is to use wire ropes in the future, why not have one of those ropes ready for use? This is, of course, standard procedure. It's what's done in most cases. And should be done wherever it isn't.

But that isn't quite all there is to it. It takes time to put a new rope on a shovel. Some ropes go on easily, some are hard to string. And, so, it is a good plan when you buy the rope, to arrange for a rope that can be reeved in the shortest time. This may mean paying a slightly higher price for the rope, but the small difference in cost gives an excellent form of production insurance.

One of the features of preformed wire rope is the ease with which it is installed. The rope is threaded through sheaves and blocks and into the eye of the drum in very short time and with comparatively little effort. The rope is not cranky, shows no inclination to kink. To say that preformed rope cuts reeving time in half is to make a conservative statement.

The well known ability of preformed wire rope to give longer service on shovels, cranes, draglines and similar machines has the effect of lengthening the intervals between shutdowns.

Thus an effective means of decreasing the frequency and length of shutdown on equipment using wire rope is to have a spare preformed rope handy at all times.



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Efficient Work Relief

IN the July issue of ROADS AND STREETS we presented a contributed editorial by Mr. E. J. Harding, Managing Director of the A.G.C. on the high cost of W.P.A. work and how the W.P.A. is doing work which rightfully should be let to contract; how the W.P.A., with its inefficient methods, is injecting itself into the field of endeavor from which the contractor must gamble out a living.

In Pennsylvania an arrangement is now being completed which will restore much work to an efficient contract basis. The Associated Pennsylvania Contractors cooperating with the Pennsylvania Department of Highways have developed a plan under which the contractor will have an opportunity to bid on projects for which he will furnish supervision, skilled labor, equipment and its operators, tools and a large portion of the materials used. The WPA will furnish to the contractor all of the common labor and probably a part of the semi-skilled labor, as well as a small part of the materials for the project. Obviously, there are a great many details which must be completed, since the standard regulations of the WPA and the highway department must be dovetailed so that a workable agreement may be created for the contractor.

Closely parallel suggestions are offered in a plan of giving work relief which was presented to the writer by Mr. B. M. Clark, Manager of Sales, The Heltzel Steel Form and Iron Company. Under it the organized contractors are the operating directors. These men, because of their training and experience, are qualified for the efficient control of the work relief projects. Engineering direction could be built upon the framework of our well organized state, county, and city highway and street departments.

Mr. Clark writes as follows:

"In practically every leading city in this country there is an A.G.C. chapter composed of men who have been successful in the construction of highways, these men can be used as a group to contact all other highway constructors in their sub-division and the projects to be built by work relief would be allocated on the basis of pre-qualification of each contractor, who would do the work on a percentage basis.

"The contractor would furnish all equipment and labor. Material would be supplied by the Federal Purchasing Department. Standard wages for each class of labor would naturally be established and also the number of hours to be worked during each week.

"The percentage which the contractor would receive for the use of his equipment and the superintending of the construction work would depend upon the efficiency and the quality of the work performed.

"The contractor would have full say with reference to the amount of work that labor should produce so that the practice of creating slackers from Federal projects would be a thing of the past.

"The same procedure could be followed in the building industry, employing engineers, architects and building contractors."

One of the work relief projects Mr. Clark suggested he discusses below:

"There has been a great deal of talk and some editorials concerning military highways which would be advantageously located across the entire width and breadth of our country. These highways, in all probability, would avoid all heavily populated districts with provision for connecting to our present highway system so that municipalities would be readily accessible from these super-highways.

"There would be distinct advantages to such a project. It would be a great boom to our economic and industrial life. A great many of our congested highways would be relieved and the motoring public would be able to travel a great, broad highway void of intersections or railway crossings.

"Such a system could be known as a 'Safety Highway' and all motorists desiring to travel with the utmost protection which engineering and construction could provide would be required to pay a small insurance premium, so as to escape the hazards prevalent on our present day routes.

"This would give employment to a great many men to collect these small insurance premiums, which in turn over a period of years would reimburse the Federal government and eventually pay for the highway and its maintenance."

Regulating Contractors

EXPERIENCE so far this year with Wisconsin's Fair Trade Practice Code for its highway construction industry has brought to light some new facts, undesirable effects that have resulted from a rather strained economic condition, the breaking of material prices, and the fact that Wisconsin's paving program was not as large as usual, thereby abnormally increasing competition among concrete paving contractors. One would anticipate that material prices would break under the present administrative setup. Material dealers may easily become dictators, as to who will get what projects.

However, Mr. Meigs, Manager of the Associated Wisconsin Contractors, states that they have new plans to counteract a recurrence of the undesirable effects that have been produced so far. It involves a change in the cost calculation factors of the schedules and a simplification of the present cost summary sheets.

Regulation or regimentation of this character is always bound to be plagued with troubles because of new equipment and machinery. A case in point is the trouble encountered in Wisconsin because of the new 34-E dual drum paver. The paving contractors, in an effort to secure work, arbitrarily adopted operating data of the dual drum paver. In the schedules of fair trade practice standards, the maximum paver size is the 27-E.

At this writing there are no dual drum 34-E pavers in Wisconsin. Nevertheless, for purposes of competitive bidding, some contractors set up a production and rental schedule of their own making for use in the trade practice schedules. Most of the contractors so doing have been tried for code violation, based on the use of equipment not listed under the code, and in hearings rather frankly admitted that they used the larger mixer figures solely for the purpose of securing work, and that they had no intention at the time of purchasing one.

Another serious fault with this type of regulation is that it penalizes the contractor who may discover or devise new or more economical construction methods. He cannot apply the advantage he has obtained.

However, the code commission believes the corrective plans they have in mind will eliminate their trouble. As inferred before, they are based upon a plan to arrive at costs for a unit rather than upon the factors involving rental and production, as is now the practice.

We admire their efforts in trying to stabilize the industry and prevent ruinous price cutting, and hope for the best for their plans. In the meantime we'll watch to learn.

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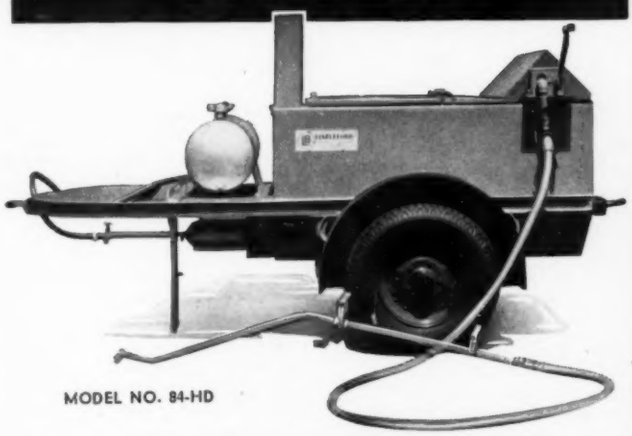

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NEW EQUIPMENT AND MATERIALS

A 43-yd. Truck

A new truck, built by the Trojan Truck Manufacturing Co., 620 East Valley Blvd., Alhambra, Calif., with a 43-yd. capacity, claimed to be the world's largest, is illustrated herewith. The truck is powered by a 180-h.p. "Caterpillar" diesel engine. An especially designed tail gate makes it possible to load the unit to its maximum capacity regardless of the type of material being handled. It unloads in 45 seconds by means of a sliding bulkhead in the body that pushes the load out and spreads it simultaneously. The diesel engine is an 8-cylinder, V-type, with a bore of 5¾ in. and a stroke of 8 in. Turning at 1,100 RPM, it develops 180 maximum horsepower. Maximum torque is 1,025 ft. lbs. at 650 RPM. The transmission is a unit power type having three speeds forward and one speed reverse, designed to take the torque and power output of the engine. An especially constructed auxiliary transmission has an overdrive, an underdrive and a direct drive. The overdrive ratio provides an increase in speed of 40 per cent over that of the direct drive, giving a maximum speed of 25 miles an hour empty and 15 miles an hour loaded to full capacity. The underdrive ratio provides a 2-1 reduction, allowing ample pulling power on average grades. The truck is a 12-wheel drive with two sets of triple tired wheels in the rear. There are, in all, 14 demountable type disc wheels, 24 x 12 in., having bolt circle diameters of 14½ in. The tires are 13.50 x 24 in., 20-ply excavator type tread.

A 43-Yd. Truck

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New Truck Mounted Crane

The latest development of the Universal Crane Division of the Thew Shovel Co., Lorain, O., is a heavy duty 13-ton truck mounted crane, designed especially for the steel erector and rigger, the sewer contractor and the bridge builder. The machine has a capacity of 26,000 lb. at 10 ft. radius in all directions, with outriggers set, and without outriggers will handle 23,300 lb. over the back, and 21,700 lb. over the side at 10 ft. radius. The machine is equipped with an all-welded boom which is made in a basic 25-ft. length consisting of two 12½-ft. sections. Suitable center sections are available to extend the boom to a maximum length of 80 ft. Tip extensions are available for greater boom lengths up to 110 ft. long or longer. The new boom is of the pin-connected design. In this design each splice is formed by four clevis and pin connections. There are no bolts used at the splices, simply four pins to drive home to give a rigid, strong splice. This extreme ease in boom assembly enables quickly changing boom lengths so as to always utilize the boom length most efficiently suited to the particular job. Another feature of the new boom is the boom lacing which, instead of being formed of individual pieces or lattice bars, is formed of a single continuous bent angle running the full length of each boom section. This has been developed to give maximum strength at minimum weight. Boom derricking and lowering are both power controlled. A special steel erector's precision boom hoist, operating through a positive ratchet and pawl on the end of the hoist shaft, gives positive power control of boom lowering operations through a wide range of lowering speeds. In addition to the 13-ton heavy-duty model, the regular line of all-purpose truck cranes and shovels in 6½ to 8½-ton crane capacities and ⅜ to ¾-yd. shovels, are continued in the Universal-Lorain line of products.

New 13-Ton Truck Mounted Crane Equipped with 75-ft. Boom

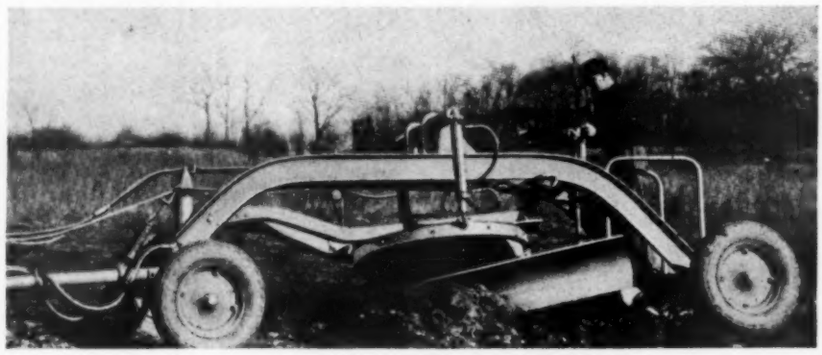
New ⅜-Yd. Shovel

A new convertible excavator has been brought out by the Hanson Excavator Works, Tiffin, O. The excavator is convertible to shovel, dragline, crane, trenchhoe, clamshell and pile driver. It has the Lockheed Hanson patented hydraulic controls of all clutches and brakes. With this system each clutch and brake control is entirely independent. There is an automatic fluid control for each clutch and brake. All clutches are of the expansion double shoe type. The turret frame, lower carbody and crawler frames are of high tensile steel electric welded throughout. All shafts on upper turret are mounted on heavy ball bearings on large Timken taper roller bearings. All parts revolving on shafts of upper turret are mounted on ball or roller bearings. There are 24 large ball or roller bearings. Shovels can be furnished with either positive cable or chain crowd. With either type crowd, boom can be raised or lowered without adjustment of cable or chain. Dipper stick crowding speed is 70 ft. per minute, retrack speed 120 ft. per minute.

▼

New Grader

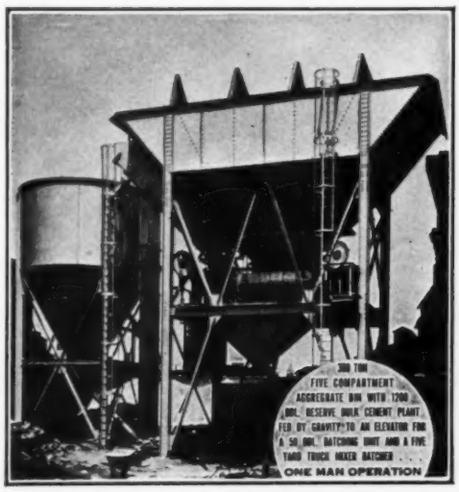
A new maintainer grader (the "55"), equipped for 1-man operation, with full power hydraulic control, for use with wheel track type tractors of medium size, has been brought out by the Good Roads Machinery Corporation, Kennett Square, Pa. The grader is stated to be strong enough and flexible enough for ditching work and other construction jobs. For this purpose it is provided with a second set of power hydraulic controls and an operators' platform. From this platform the operator has an unobstructed view of the blade, and an instantaneous, effortless control over raising, lowering and sideshifting the blade, and sideshifting the grader on the rear axle. An interesting and entirely new feature of the grader is the unique design of the circle. Two large diameter concentric circular steel plates are flanged and fitted one inside the other. The larger, outside plate is welded to the drawbar; the smaller turns easily inside the larger, yet is closely fitted and firmly held to prevent chattering. The moldboard is attached to heavy steel plates welded to the inner circle. In tests and under various working conditions, it is claimed, this construction proves to be exceptionally strong, does away with chatter, and provides easy adjustment of blade angle.



Good Roads "55" on a Ditching Job

HELTZEL BIN EQUIPMENT . . .

Whenever or wherever storage, batching or bulk cement plants are needed Heltzel-built equipment has always been the leader in point of service, ease of installation, economy of operation and length of service. Portable bins, built to suit the requirements of the concern whose base of operations change from place to place, are the only PORTABLE bins on the market.



Standard Circular, Square and Oblong bins, ranging in capacity from 35 to 500 tons, available in one, two, three and four compartments, featuring convertibility from one to two or three or four compartments without making alterations or changes in weighing or batcher equipment, make specially built or designed equipment almost unnecessary.

Bulletins S-18-B and S-21-B, describing in detail these plants and their varied applications, are ready. Write today for your copies.

Heltzel
BUILDS IT BETTER

- BINS, Portable and Stationary
- CEMENT BINS, Portable and Stationary
- CENTRAL MIXING PLANTS
- BATCHERS (for batch trucks or truck mixers with automatic dial or beam scale)
- BITUMINOUS PAVING FORMS
- ROAD FORMS (with lip curb and integral curb attachments)
- CURB FORMS
- CURB AND GUTTER FORMS
- SIDEWALK FORMS
- SEWER AND TUNNEL FORMS
- SUBGRADE TESTERS
- SUBGRADE PLANERS
- TOOL BOXES
- FINISHING TOOLS FOR CONCRETE ROADS

HELTZEL STEEL FORM & IRON CO.
WARREN, OHIO, U.S.A.

TALCO PRODUCTS

QUALITY ASPHALTS

- CUTBACKS • ROAD OILS
- FLUX OILS • ROOFING
- PENETRATION GRADES

QUALITY GASOLINES

70 OCTANE, highly anti-knock, ample reserve, quick shipment.

TALCO ASPHALT & REFINING CO.
Mount Pleasant, Texas

Slackline Lifting Gravel from River to Screening Plant.

Scraper Moving Gravel from High Bank to Crusher.

Gravel Produced At Low Cost

More sand and gravel is excavated annually in the United States by Sauerman Slacklines and Drag Scrapers than by any other make of excavating equipment.

There is a sound reason for this preference. A Sauerman machine can reach across a wide pit or river or to the top of a high hill and move the materials from this point direct to a screening plant or loading hopper in a simple, continuous, straight-line operation. Other types of excavators require the aid of auxiliary conveyors.

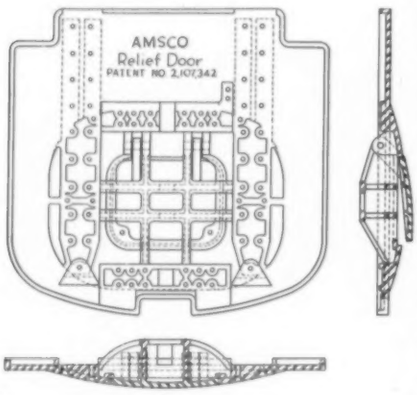
Thus a Sauerman machine is able to produce gravel from any deposit—wet or dry—at a reduced cost per cubic yard.

Several hundred examples of Sauerman machines at work in gravel pits and on other long haul work are shown in Catalog No. 18. Write for a free copy of this book today.

SAUERMAN BROS.
488 S. Clinton St. CHICAGO

New Relief Door for Dippers

A relief door for dredge and power shovel dippers on which patent No. 2,107,342 has been granted, is now being built by the American Manganese Steel Division



New AMSCO Relief Door

of the American Brake Shoe & Foundry Co., Chicago Heights, Ill. This relief door is designed to reduce the resistance encountered when a dipper is lowered into water. The new design permits water to enter through a small auxiliary door in the dipper door, operating in a similar manner to a flap valve. When the dipper is filled with material, the relief door is held closed. The inside of the dipper door is slightly convex, the relief door forming the center portion of the curve. The outside of the main door has double ribs crossing the relief opening and supporting the relief door when it is closed. The hinges and latch mechanism are of the same construction and function the same as on an ordinary dipper door. The construction of the AMSCO relief door is claimed to make it particularly advantageous in excavating rocky material from under water.

▼

New Hydraulic Scrapers

A new line of hydraulic scrapers now being introduced by the Baker Manufacturing Co., Springfield, Ill., is stated to combine two exclusive new features which greatly increase their efficiency. If you have ever seen an old-time "mule skinner" handle a slip scraper, you know that his main problem was to hold the scraper at just the right angle to secure a capacity load in the least possible time. This is the principle which Baker engineers have applied to the new line of Baker hydraulic scrapers. The cutting edge of the pan is held at a flat digging angle, which permits the dirt to pass rapidly to the rear of the pan, thus loading it naturally from rear to front. Having determined that a flat digging angle is most efficient, Baker engineers were confronted by the problem of raising the pan to afford ample clearance in hauling and dumping. This is solved by means of powerful springs at the rear of the pan. When loading, these springs are automatically compressed, lowering the pan into digging position. When the load is secured, the springs are released, thus raising the pan for hauling and spreading. The hydraulic system, operated from the driver's seat, is stated to insure perfect control of all operations. The scrapers are of all alloy steel construction, combining light weight with great strength for handling the toughest jobs. The 2½-yd. scraper, illustrated, is now in production. Other sizes will be available at a later date.

▼

A New Marsh Buggy

A truck designed especially for traversing mud, sand and swamp lands has been brought out by the Marmon-Herrington Co., Inc., Indianapolis, Ind. The truck is

The Marmon-Harrington Marsh-Buggy

a combination of the extra available power of all-wheel-drive and the positive traction and flotation of 13.50x24 single tires mounted, front and rear, on spoke type disc wheels. The marsh-buggy has a 135-in. wheelbase and its power plant is the 85 HP. Ford V-8 motor.

▼

New Industrial Motor

A new 4-cycle air-cooled gasoline motor (model IBP) has been announced by Briggs & Stratton Corp., Milwaukee, Wis. Actual horsepower over the recommended operating range is .93 at 2,600 r.p.m.; 1.00 at 3,000 r.p.m., and .98 at 3,200 r.p.m. Piston displacement is 4.71 cu. in. with a 2 in. x 1½ in. bore and stroke. Ignition is supplied by a specially designed dust and moisture proof high tension flywheel magneto. Other standard equipment includes Silchrome exhaust valve with alloy steel inserted seat, Molybdenum alloy valve guides, aluminum alloy cylinder head, adjustable pneumatic governor, drop forged crankshaft with ball-bearing and oil seal, specially designed float feed carburetor, gasoline filter, oil-bath air cleaner, screened blower case, crankcase drilled and tapped for direct mounting of equipment and many other features. Fuel tank capacity is ½ gal. and oil reservoir 1½ pints. Overall dimensions are: Height 14 in., width 10½ in., depth 11 in. Net weight 38 lb.

▼

New ¾ Yd Convertible Shovel

A new ¾ yd convertible model ("LS-80") shovel has been announced by the Speeder Machinery Corporation, Cedar Rapids, Ia. This 19-ton machine has electric welded, alloy-steel lower base, positive steering, and traction lock controlled from operator's seat. The "LS-80" has two

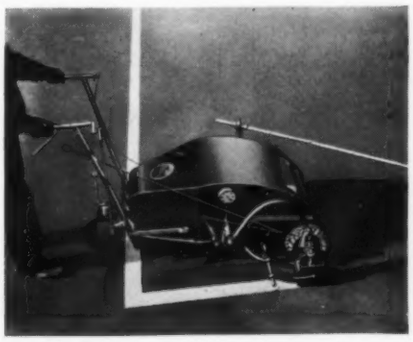
Speeder Model "LS-80" Shovel

speeds in traction and either 20-in. and 24-in. lug-driven tracks or "Caterpillar" tractor tracks available. All upper machinery is behind oversized center pin which cares for horizontal stresses. Four hook rollers riding on large diameter turntable care for vertical stresses. There are two independently mounted power drums and a positive, self-locking, worm-geared, 2-speed boom hoist. Oversized clutches and brakes reduce heat to a minimum and prevent operator fatigue. Positive chain crowd only with full struck measure ¾ yd manganese dipper front bucket. The machine is powered by 80 H.P. gasoline or diesel engine, It has a smart, heavy-gauge, streamlined cab.

New 2½-Yard Scraper.

New Street Marker

A compact, self-propelling, marking unit claimed to be adaptable to all kinds of striping jobs—centerline (single or double), diagonal or parallel parking, cross walks, safety zones, etc.—has been placed on the market by Meili-Blumberg Corporation, New Holstein, Wis. The marker also is claimed to be equally effective on any type of hard surfaced road, regardless of the usual irregularities encountered. Stripes of different widths can be made by simply changing the nozzle housing and brushes. The marker is one-man operated and the operator easily controls painting, steering and speed of marking without lifting his hands off the handle bars. A single lever controls the paint flow. Before paint is



The M-B Street Marker

applied, the exhaust from the engine is blown directly in the path of the painting unit. Paint is then sprayed onto the pavement and finished with a brush mounted behind the spray box. An ingenious rod and chain arrangement is used as a guide for the operator in marking the street or highway.

▼

New Oil Burner for Kettles

A new oil burner for tar and asphalt kettles, tool heaters and bituminous distributors, claimed to give positive and instantaneous flame control, has been put on the market by the Hauck Manufacturing Co., 126 Tenth St., Brooklyn, N. Y. It is stated the flame control is obtained because the patented construction causes a unique change inside the combustion chamber or burner shell, which, by moving a lever, changes the size of the flame and quantity of heat. The fuel is kept vaporized so that the burner cannot form carbon or burn with a yellowish flame. On the new burner the needle valve is used only when starting—it is opened a half turn and the operator never touches it again until the burner is shut off. The flame is regulated with a control lever. The heater coils are of seamless steel tubing, specially treated to remove scale. The combination needle valve and strainer come with full union connection so that the burner can be used with any make of oil tank and hose. The Hauck tanks are of seamless drawn steel with the exception of the 5-gal. tank, which is of welded steel construction. They are tinned inside and outside to make them rustproof, equipped with pressure gauge, all-brass pump, tank needle valve—and 1½-in. handtite filler cap; no wrenches required.

"...quiet and economical performance... can be checked on the job at any time."

E. WILHELM
City Engineer

CITY OF BAY CITY
MICHIGAN

March 8, 1938

Mr. W. H. Duffill,
Worthington Pump & Machinery Corp.,
2824 East Grand Blvd.,
Detroit, Michigan.

Dear Mr. Duffill:

We are pleased that we have been supplied with our fifth Worthington 105 C. F. M. Portable Air Compressor.

The performance of the four units put into service in 1936 on our tunnel work has been quite satisfactory. In approximately 16 months of continuous service on the jobs operating 24 hours per day we have replaced the valve strips in one valve of one machine only which had been subjected to exceptionally hard service in sand blasting. As the repairs were made by the Superintendent with strips from the tool kit supplied with the machines, we have required no service.

The quiet and economical performance record of these machines can be checked on the job at any time.

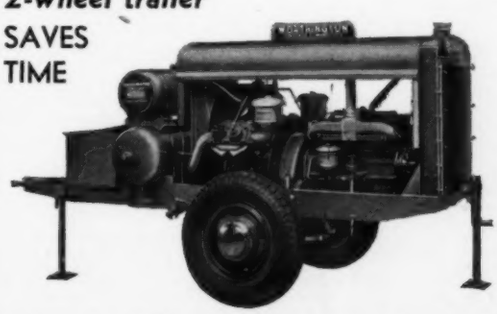
Very truly yours,

E. Wilhelm

EPW.MD

E. Wilhelm - City Engineer.

This fast-towing 2-wheel trailer SAVES TIME



PORTABLE COMPRESSORS
60, 105, 160, 210, 315 CU. FT. ACTUAL CAPACITY
Gasoline engine or diesel engine drive
All types of mountings

SEMI-PORTABLE COMPRESSORS
FOR ANY CAPACITY
Gasoline engine or electric motor drive through Multi-V-Belt

Check Worthington Portables on your Job

Ask for a demonstration
. . . there's a Worthington Dealer near you

WORTHINGTON PUMP AND MACHINERY CORPORATION
General Offices: HARRISON, NEW JERSEY

PC8-12

Spiralock Suction Hose

A water suction hose introducing an entirely new construction has been announced by the B. F. Goodrich Co., Akron, O. Known as Spiralock, this smooth bore

Goodrich Spiralock Suction Hose

hose is designed for either suction or discharge service and is capable of handling pressures up to 30 lb. per square inch. Spiralock suction hose derives its name from the patented spiralock construction. Developed by Goodrich engineers, this special construction makes possible a hose which is light in weight and extremely flexible for easy handling, yet sufficiently durable to withstand hard service. Locking of the fabric around the spiral wire insert anchors the wire securely in place. Should the hose be crushed, the wire can be pounded back into position without serious damage. Spiralock suction hose is available in sizes ranging from 1½ in. to 4 in. and at present is limited to 20-ft. lengths with straight or enlarged ends. Where special couplings are to be accommodated, the O.D. of ends can be varied by minus ⅛ in. plus ¼ in. and the length of blank ends may also be altered.

▼

New Trucks

Two new models, CU and CUA, whose rated capacity is 3 to 4 tons and gross vehicle weight 21,000 lbs. have been announced by the Four Wheel Drive Auto Co., Clintonville, Wis. Designed to give maximum performance, and having new styling, the models incorporate the basic principles adhered to by The Four Wheel Drive Auto Co. for 28 consecutive years of manufacturing. Developing 96 BHP, and 280 lbs. ft. of torque, these two FWD models are designed for mounting a wide variety of auxiliary equipment and bodies. Also included among the mechanical features of the models are: 5-speed transmission; a midship sliding jaw clutch type on the CU and a sliding gear unit type on the CUA; 14-in. single plate clutch; gear ratios of 7.31:1 standard, and 6.72:1, and 8.84:1 optional; single reduction, bevel gear type, full floating axles, with split type housing, both front and rear; 9.75x20 tires, singles front and rear, duals optional at extra cost; 71-in. tread; 150-in. wheelbase, standard. While the general principle of construction and units used are practically the same as in previous models, many refinements have been incorporated in these new FWD models. The frame width has been changed to 34-in. from 36-in. This permits more tire clearance where duals are used on the rear, and also permits the use of a wider spring than previously. The rear springs have been increased from 2½ in. width to 3 in. width, with swinging-shackle type of hanger now being used, both front and rear. The cab width has been increased from 60-in. to 70-in. at the rear. On the front of the truck, a channel steel bumper is now standard equipment. It is easily removable for installation of snow removal equipment. Controls have been simplified throughout, and minor improvements altogether add to the ease of operation and effect a simplification of maintenance. To permit ready installation of various control valves for the operation of plows, underbody scrapers, and various other hydraulically controlled equipment, the instrument panel has been offset to the left of the cab, and is readily visible to the operator through the large steering wheel. Grouped on the instrument panel are a speedometer, ammeter, oil gauge, gasoline gauge, and engine heat indicator. By this panel installation, the control valves may be mounted on the dash, under the cowl with only the control handles protruding into the cab, and providing a clear space for the knees and feet of the operator.

New FWD Truck

▼

Hook-Ring for Woven Tapes

A folding end hook of new pattern for woven tapes is offered by the Lufkin Rule Co., Saginaw, Mich., and New York City. It enables one man to take many measurements unassisted. This is a small, yet sturdy, steel hook permanently affixed to tape ring, not detachable. It will hold tape at end of a board or pipe, corner of a building, and hundreds of other places, yet readily folds flat against the tape ring, out of the way, in no way hindering use of tape without hook, and then also it will not catch objects or prevent tape line being fully wound into the case. Friction holds

Folding End Hook-Ring

hook in position when open and closed. Zero falls at inside of open hook. The two prongs of this hook-ring are widely spaced, and each has anchor spur, hence it takes a firm, square hold. The spurs grip when tape is under tension, also prevent losing hold by side sway, yet tape releases itself when tension is released. Being permanently attached, this hook-ring is supplied only with tapes, not sold separately.

New Variable Weight Rollers

An addition to their line of 3-wheel road rollers has been announced by the Hercules Co. of Marion, O. This comprises a group of variable weight rollers of the 3-wheeled type. One of these new models

New 7 to 8-Ton Roller

—the 7 to 8-ton size—is illustrated herewith. Its weight with empty rolls is approximately 14,000 lb. and with the rolls filled with water, slightly over 16,000 lb. In addition, the two large tanks mounted on the side of the roller frame will carry an additional 100 gal., or increasing the total weight still further to the amount of 800 lb. Other than the special water ballasted front and rear rolls, there are no changes in the basic design of Hercules rollers. By introducing these new models, The Hercules Co. believe they are making a contribution to the road building industry, as a variable weight 3-wheel roller lends itself to a wider range of application without materially increasing the investment.

▼

New 3½ Mixer

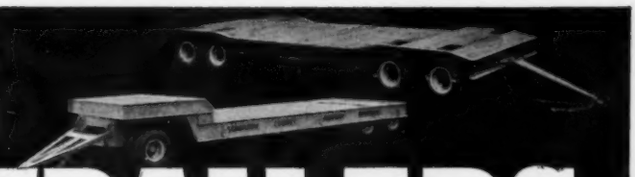
A new 3½ non-tilt end discharge model has been introduced by the Construction Machinery Co., Waterloo, Ia. One of the principal features of this new CMC end discharge 3½, according to the factory, is its large production due to the new low front, high back, gated batch hopper. Mixing delays due to loading are eliminated in this new model. Other features are, balloon pneumatic tired wheels, Timken bearings, cantilever springs, disappearing tongue, air-cooled engine, accurate vertical syphone measuring water tank (when wanted), CMC proved double-quick mix and remix action.

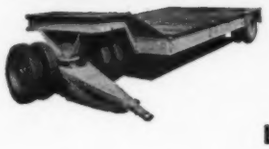
▼

Reflecting Traffic Markers and Light-Operated Bell Ringers

Recent innovations of the Star-Lite Marker Company, 129 East Market Street, Indianapolis, Indiana, include the "twin," a connected dual reflecting traffic marker especially designed for obstructive visible channelizing; the "Fog-Lite," a triple-button marker having a contrast of white with center red or amber, designed for especial efficiency in fog, and providing obstructive deflection without sideslip; and the "Beacon-Bell," designed to provide an audible warning where necessary, in addition a visible traffic line marker. The "Beacon-Bell" may be installed alone or in combination with single, twin, or triplet reflectors.

LA CROSSE Heavy Duty TRAILERS





The most complete line on the market. Capacities, five to two hundred tons. Four to sixteen wheels. Two to eight axles. They are built to take the heaviest loads safely, and with the least damage to road beds. Write today. Just tell us what you have to move.

THE LARGEST TRAILER IN THE WORLD IS A LA CROSSE !

LA CROSSE TRAILER & EQUIPMENT CO., LA CROSSE, WIS., U.S.A.
DIVISION OF LA CROSSE BOILER CO.

"WHY GUESS?"

When ordering finishing machine and joint installing equipment, why guess when you can secure a product which has proven itself in producing a better job? After all, that is what you want.

FLEXIBLE ROAD JOINT MACHINE COMPANY
WARREN, OHIO

NOW!

Built for Highway Mowing TORO ROUGHMASTER

The need of heavy, cumbersome farm or industrial tractors weighing upwards of three thousand pounds is over as far as mowing is concerned.

Note these specifications—

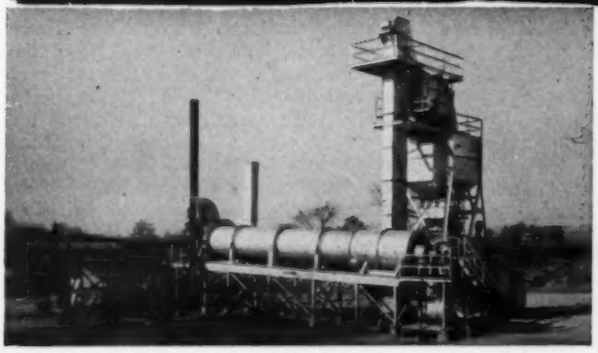
- a wheel base of only 71 inches.
- a turning radius of 6¾ feet.
- a speed range up to 15 miles per hour.
- a new improved sickle bar with a cutting range from 45° above to 40° below horizontal.
- controls that anyone can drive without special training.
- a normal life of ten years or more.
- a common sense low price.

There is a tremendous interest this year in Highway Mowers and the Roughmaster is the answer to the many requests for a light, strong, easily handled machine, and at a price that every State and County can afford.

Send for Interesting Circular

TORO MANUFACTURING CORPORATION
Minneapolis Minnesota

H&B ASPHALT PAVING MACHINERY H&B



The H & B tower type plant combines portability and large capacity. Built by manufacturers of asphalt paving machinery for over 30 years.

Send for our new bulletin T-247

JOT YOUR NAME on THE MARGIN of THIS AD and MAIL IT to US TODAY.

HETHERINGTON & BERNER INC.
ENGINEERS—MANUFACTURERS
INDIANAPOLIS, IND.

New Low-Cost Hydraulic Control

"Multi-Power-Packer" is the name of a new hand-operated hydraulic control pump brought out by Blackhawk Manufacturing Co. of Milwaukee, Wis.

The original "Power-Packer" was developed for use on snowplows, bulldozers, roadscrapers and all other material handling or road building equipment requiring intermittent raising and lowering of one operating part. The "Multi-Power-Packer" is applicable to all equipment requiring periodic raising and lowering of more than one part. It will operate one to five rams —independently of each other, or all together, or in any combination. Five selector valves permit selective action on individual rams, while single control valve gives simultaneous control over any combination of rams.

Blackhawk's New "Multi-Power-Packer"

Low first cost and maintenance cost, with entire absence of operating cost, are claimed by the manufacturer. The following points are featured:

1. Pump unit completely enclosed, with no external pipes or outlets. Connection from pump to the different rams made by wire mesh rubber hose or copper tubing.
2. All outlets above oil line—eliminate leakage—dependable oil flow assured.
3. Filler plugs easily accessible—on top of cover plate.
4. External cap screws in cover plate easily removed to get at gravity-seating, ball-check vertical valves.

▼

New Drifter

A new automatic drifter having an adjustable feed for efficient drilling in changeable rock has been brought out by the Sullivan Machinery Co., Claremont, N. H. The drive unit has three major parts combining simplicity of feed control, a compact housing with oil reservoir and large ground surfaces for abundant bearing area,

Sullivan Automatic "Adjust-O-Feed" Drifter

and a driving sprocket with large bearing area and an increased number of ratchet teeth, so that a .012-in. movement of the drilling machine engages a pawl. The drifter has a chain drive and an air-operated rotation release.

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WITH THE MANUFACTURERS

New Pennsylvania Chapter Joins N.I.A.A.

The National Industrial Advertisers Association has welcomed its 16th local chapter organization, the Mason-Dixon Industrial Advertisers, of which Terry Mitchell, advertising manager of the Frick Co., Waynesboro, Pa., is president. The group has been actively associated with N.I.A.A. for some time under the name of the Cumberland Valley Industrial Advertisers. James Kuester, Road Machinery Co., of York, Pa., is vice-president; Melvin Henneberger, Landis Machine Co., Waynesboro, is secretary; and Guy Washinger, T. B. Woods Sons, Chambersburg, Pa., is treasurer. The N.I.A.A. Charter will be presented by Frank O. Wyse, Bucyrus-Erie Co., president of the National Industrial Advertisers Association, early in August.

▼

J. S. Dempesy Elected President Buda Co.

At the July meeting of the Board of Directors of the Buda Co., Harvey, Ill., Mr. L. M. Viles, president for over 20 years, was elected to the position of chairman of the board. Mr. J. S. Dempesy, who has served the company for many years as secretary, treasurer and vice president, was elected president to succeed Mr. Viles. At the same time, Mr. F. E. Place, who has been associated with the Buda Co. since 1908, retired as senior vice president. An executive committee consisting of Mr. Dempesy and two operating vice presidents, Mr. R. K. Mangan and Mr. E. D. Conant, will direct the affairs of the company.

▼

Broderick & Bascom Purchase Murray Safety Sling Co.

The Broderick & Bascom Rope Co., St. Louis, Mo., has purchased the business and patents of the Murray Safety Sling Co. of Pittsburgh, Pa. Mr. D. Murray, who is the original manufacturer of plaited wire rope safety slings, has sold his patents to the Broderick & Bascom Rope Co., and will himself join this company, being in charge of the Murray Safety Sling Division factory at 33 Water St., Pittsburgh, Pa. The business will of course be handled through Broderick & Bascom's main office at 4203 N. Union Blvd., St. Louis, Mo., and through their branches and distributors throughout the United States.

▼

Ransome Appoints Ives Equipment Co. Representative

Earl Ives Equipment Co., 1419 Mentor Ave., Mentor, O., have just been appointed exclusive representatives by Ransome Concrete Machinery Co., Dunellen, N. J., for their truck mixers and agitators.

Steel Founders' Society Appoints C. W. Briggs Technical Engineer

Steel Founders' Society of America, Cleveland, O., has announced that, on or about Oct. 1, 1938, Mr. C. W. Briggs, physical metallurgist, Naval Research Laboratory, Washington, D. C., will join the society's staff in the capacity of technical engineer. Mr. Briggs is a graduate of Stanford University. Since taking his degree in metallurgy (Sigma Xi) he has devoted most of his time to research work for the U. S. Navy, being at present the directing head of the Steel Casting research department. Most of his investigations have had to do with Steel Casting development work. Mr. Briggs is well known for his many contributions to recent technical literature in the steel casting field. The author of numerous technical papers and magazine articles, he is a life member of A. F. A., the 1937 recipient of the A. F. A.'s William McFadden Gold Medal for outstanding research in Cast steel. Among the projects which Mr. Briggs will initiate in his new connection will be the development of a cast steel data book for the use of engineers, designers, engineering students, etc. He will likewise handle other technical phases of the society's activities.

▼

Federal Motor Truck Co. Reports June Sales 10% Ahead of May

Final reports for the month of June show sales of Federal Motor Trucks 10 per cent ahead of the corresponding figures for May, according to K. M. Schaefer, general sales manager. The volume was the best for any month since March, said Schaefer, and shows every indication of continued improvement. "Particularly encouraging," he stated, "in view of the reported general shortage of working capital in the retail field, is the fact that the Federal dealer organization has been increased by 30 per cent since the first of the year. And the new dealers included in the increase show signs of vigorous activity in that they accounted for 32 per cent of our total business in June. We plan to continue with an intensive expansion program in our selling organization, and believe that this, accompanied by the inevitable improvement in construction and related industries, will make our second six months markedly better than the first," he concluded.

▼

Worthington Appoints New Philadelphia Manager

Mr. William J. Daly, formerly Detroit district sales manager for Worthington Pump and Machinery Corporation, has been transferred to the corporation's Philadelphia Office, to succeed Mr. C. H. Shaw, deceased. Graduated from Notre Dame University in 1922, Mr. Daly joined the Worthington organization in the same year as a student engineer. Since that time he has held various important positions in the corporation, some of which were: Special engineer in air compressor sales, assistant sales manager of its Cincinnati Works, manager of its Industrial Sales Division, and Detroit district sales manager. Mr. Daly will be assisted by Mr. W. J. Van Vleck, recently appointed assistant manager in the Philadelphia district.

Three Baker Bulldozers on Allis-Chalmers Tractors, levelling on New York World's Fair Site. Scores of Baker Bulldozers are on the grounds.

The unusually successful performance of Baker Direct Lift Hydraulic Bulldozers and Gradebuilders is due to their simplicity, great strength and smooth performance. There are combination moldboards which give scores of added uses for your tractor. Hundreds of leading contractors economize with Bakers.

Ask for Bulldozer Bulletins

THE BAKER MFG. CO., 506 Stanford Ave.
Springfield, Ill.

BAKER
BULLDOZERS

Hydraulic Scrapers

Road Rooters and Discs

Multiple Blade Maintainers

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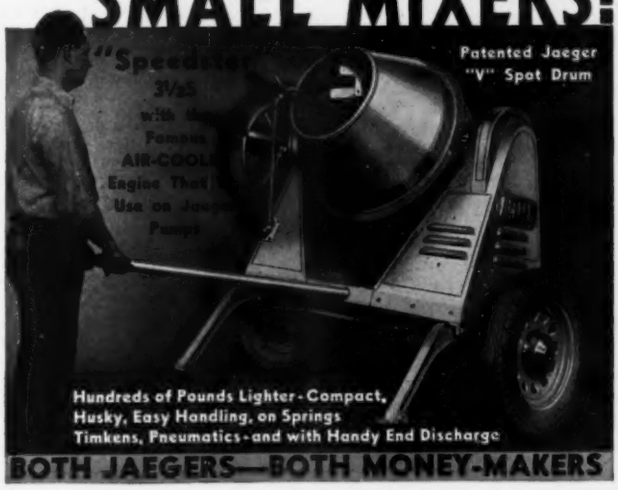
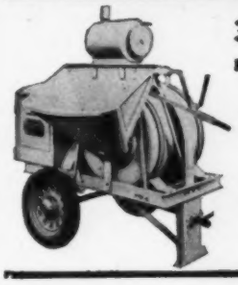

Patented Jaeger
"V" Spot Drum
Hundreds of Pounds Lighter - Compact,
Husky, Easy Handling, on Springs
Timkens, Pneumatics - and with Handy End Discharge

BOTH JAEGERS—BOTH MONEY-MAKERS



3½S UTILITY WITH MEASURING BATCH HOPPER

Fast as a Power Loader—Up to 40 Yds. a Day

Load next batch while you mix and discharge — no waiting — 30% to 40% more yardage daily, all your job can handle. Saves you about half the cost of heavy 5S Non-Tilts. Get new catalog and prices.

THE JAEGER MACHINE COMPANY
223 Dublin Avenue Columbus, Ohio

Did You Know That—

LACKING ROAD ROLLERS TO COMPACT THE STONE ON THE NATIONAL ROAD BEING BUILT BETWEEN CUMBERLAND AND THE OHIO RIVER, IN THE EARLY 1800's, ENGINEERS IN CHARGE OBLIGED PASSING TRAFFIC TO DO THE COMPACTING, SHUNTING ALL WAGONS OVER THE ROUGH, COARSE SURFACE. SINCE MANY WAGONS OF THE PERIOD WERE SPRINGLESS, THE RIDE WAS ANYTHING BUT ENJOYABLE. THE ENGINEERS, IT IS SAID, SHOWED CONSIDERABLE CUNNING IN THE WAY THEY SHIFTED BARRIERS SO AS TO FORCE TRAVELLERS TO DRIVE OVER THE UNFINISHED PORTIONS.

Five years of grueling-on-the-job tests, by skeptics, and the Burch Hydromotor Hoist stands definitely proven as today's outstanding hydraulic hoist for dump bodies.

IT HAS NO EQUAL *in*—

Power
Stamina
***and* Economy**

Balanced power for raising or lowering — automatically locks any position — one moving part — no gears — no oil lines. Full line of sturdily-built bodies.

Write for LITERATURE

THE BURCH CORPORATION
Dept. F-3 CRESTLINE, OHIO

Link-Belt Promotes Bond and Dyson

Link-Belt Company announces that Mr. William W. Bond has been appointed western sales manager of the positive drive division, with headquarters at the Dodge plant in Indianapolis, to succeed G. Howard Burkholder, deceased. Mr. Bond has been in the company's employ since 1911, first serving in the engineering department at the Philadelphia plant. For the last 15 years he has been engaged in the sale of roller chain drives.

William W. Bond

Ralph S. Dyson

Coincidentally with Mr. Bond's promotion, Mr. Ralph S. Dyson, for many years manager of stock silent and roller chain drives through distributors, will also head up roller chain sales to duplicate machinery manufacturers. Mr. Dyson entered the company employ in 1899.

▼

New Detroit Manager Appointed by Worthington

Worthington Pump & Machinery Corporation of Harrison, N. J., announces the appointment of Mr. Ludwig Emde to the position of Detroit district sales manager. A member of the Worthington organization since his graduation from the University of Michigan in 1930, Mr. Emde is well known in the Detroit district. He will succeed Mr. William J. Daly, recently transferred to the corporation's Philadelphia office as manager.

▼

NEW LITERATURE

Truck Cranes—The Harnischfeger Corporation, Milwaukee, Wis., has issued Bulletin TX-45, which completely describes the many sizes and types of P&H truck-mounted cranes and excavators. Nearly half of its 30 pages are devoted to "candid" action pictures, which illustrate the P&H truck crane's many uses. Full, page-sized photographs describe the entire mechanism of the P&H truck crane. Condensed specifications and clearance diagrams are also given.

Spreaderoller—The Universal Crusher Co., Cedar Rapids, Ia., has issued Bulletin 800 covering the "Chip-Top" spreaderoller recently introduced by them. The bulletin graphically illustrates the operation of the spreaderoller, showing how it applies seal coat to freshly oiled roads and streets, applying the large material first, the medium next, and the fines on top, and rolling them smooth immediately after depositing them, providing a white-topped, highly visible, skid-proof surface. Specifications and working capacity are also given.

Tank Car Heaters—A new catalog has been issued by Cleaver-Brooks Co., 3112 West Center St., Milwaukee, Wis., giving very complete descriptions of its streamlined steam tank car heaters, pumping boosters, storage tank boosters, automatic heaters for asphalt plant and tank car unloading valve. The various units are illustrated and described and in addition diagrams are included showing various features of the design. Diagrams showing hook-ups are also given.

Construction Equipment — The Chain Belt Co., Milwaukee, Wis., has just issued a 24-page catalog in Spanish covering its complete line of Rex construction equipment.

Chain Hoists—A new catalog, No. 38, has just been issued by the Ford Chain Block Division of American Chain & Cable Company, Inc., Philadelphia, Pa. In addition to the regular Ford line of spur geared, screw and differential chain hoists, several additional items have been added, such as jib cranes and differential hoists with ball-bearing mountings. The new ball-bearing Ford spur geared hoist is featured in the catalog.

Patrol Sweeper—An 8-page bulletin on its new patrol sweeper has been issued by the Austin-Western Road Machinery Co., Aurora, Ill. This new sweeper, originally designed for small cities, cleans 5½ ft. of pavement at a single pass, sweeping the area it covers as thoroughly as a larger sweeper.

Road Roller—An 8-page bulletin for its Chief road roller has been issued by The Galion Iron Works & Mfg. Co., Galion, O. The various features of the roller are illustrated and described. Specifications and dimensions are included.

Vertical Gas Engine—Bulletin S-550-B14 recently issued by Worthington Pump and Machinery Corporation of Harrison, New Jersey, the latest addition to the corporation's extensive line of gas engines is described. To be known as the type LPE, the new engine is of the vertical four-cycle design, a power unit arrangement of the LCE gas engine compressor unit. With the exception that frame extensions and running gear for the compressor cylinder have been omitted, the units are similar and all component parts are interchangeable between them.

The LPE engine is of the multi-cylinder, trunk-piston type with cylinders of the L-head design arranged in line. The entire unit is totally enclosed and has full circulating pressure lubrication throughout. The straight-line arrangement of cylinders provides accessibility and permits equal intervals between power impulses. This latter feature produces uniform turning effort and smooth operation with a very small flywheel. A single magneto can be used for all cylinders.

Units are available in four, six and eight-cylinder arrangements, rated at 180, 270 and 360 b.hp. when running at 400 r.p.m.

Crushing and Screening Equipment—The Universal Crusher Company, Cedar Rapids, Ia., has issued four new bulletins on crushing plants.

Bulletin No. 14 covers their 180-Q portable single crusher quarry plants with elevator screen, over-size return and bin.

Bulletin No. 28 pictures and describes the 248-Q dual crusher quarry plants comprising a primary jaw crusher and secondary roll crusher on trucks, feeder conveyors, screen, oversize chute to roll crusher and bin.

Bulletin No. 34 contains detailed data on the 66-G portable single crusher gravel plant consisting of a jaw crusher, elevator, screen, mixing hopper, feed and loading conveyors mounted on a single compact chassis.

Bulletin No. 37 covers Universal's 199-G single crusher gravel plant consisting of a jaw crusher, bar grizzly and by-pass mounted over the crusher feed opening, pivoting bucket elevator and feed conveyor.

Heavy-Duty Motor Graders—A new folder from J. D. Adams Company of Indianapolis shows heavy-duty graders in various services and under widely differing conditions. Brief descriptions and explanations are given. Three models are covered.

Mixers, Pumps and Pumpcrete Equipment—Chain Belt Company, Milwaukee, Wisconsin, has just issued a folder covering many items of its "Rex" line of pumps, concrete mixers, mortar mixers, cold patch mixers, and the "160 Pumpcrete."

Bituminous Distributor.—Many important details of the Model C distributor, made by Littleford Brothers of Cincinnati, are explained and illustrated in a newly issued circular. The "Instant Action" spray bar is featured.

Convertible Shovels and a Trailer—A 16-page pocket size booklet clearly describes the line of 12 fully convertible shovels from ⅜-yard to 1¼-yard capacity made by Bay City Shovels, Inc., of Bay City, Michigan. A trailer capable of carrying up to 25 tons, and especially designed for shovel owners, is also covered. The trailer is available in four models, designed mixers, rollers, pumps, etc., as well as for shovels.

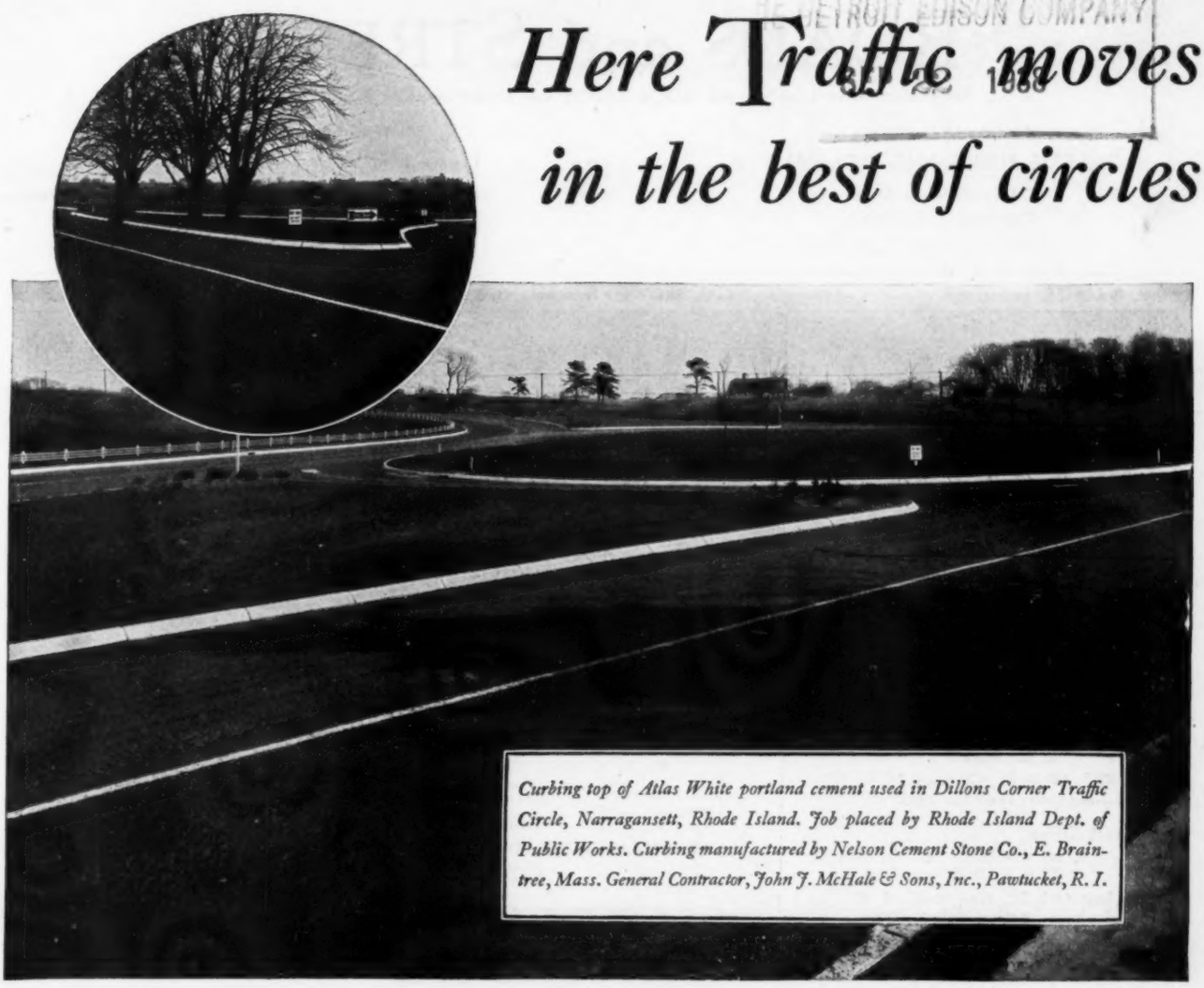
Leaning Wheel Graders—J. D. Adams Company of Indianapolis in a new 16-page booklet, tell very briefly what a lot of users think of their leaning wheel graders. Along with the quotations they give a series of excellent illustrations of the units and certain of their details. Brief descriptions are included.

Reflecting Markers—Star-Lite Marker Company, Indianapolis, Indiana, has issued several folders giving details and uses of its markers and reflector chains. The descriptions give sizes and other useful information.

Derricks — Under the title "Clyde Whirley," the Clyde Iron Works of Duluth, Minnesota, has issued a very attractive 24-page, letter size bulletin, showing derricks in operation in many places and under many different conditions. Details of the equipment are pictured and described, and a capacity chart is given.

LIBRARY
THE DETROIT EDISON COMPANY

Here Traffic moves in the best of circles



Curbing top of Atlas White portland cement used in Dillons Corner Traffic Circle, Narragansett, Rhode Island. Job placed by Rhode Island Dept. of Public Works. Curbing manufactured by Nelson Cement Stone Co., E. Braintree, Mass. General Contractor, John J. McHale & Sons, Inc., Pawtucket, R. I.

Traffic circles of Atlas White curbing require no maintenance—no repairs or replacements

THIS corner is well-engineered from two standpoints—safety and economy.

Curbing top is of Atlas White portland cement—easy to see, and permanently white. Painting will never be necessary. Moreover, repairs and replacements will not be required. These money-saving characteristics of Atlas White portland cement concrete have demonstrated to many highway officials that Atlas White curbing—and markers—actually pay for themselves within a few years.

Atlas White curbing and markers are easily, quickly placed. Neither specially trained labor nor costly equipment is needed. They can be made "on location"—or pre-cast in sections indoors and moved to the job. Universal Atlas Cement Co. (United States Steel Corporation Subsidiary), 208 South La Salle Street, Chicago.

M-22

ATLAS WHITE PORTLAND CEMENT FOR MARKERS AND CURBS

ROADS and STREETS

With which have been merged GOOD ROADS and ENGINEERING & CONTRACTING

Published Monthly by
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330 South Wells Street
CHICAGO, ILLINOIS

THIS MAGAZINE IS DEVOTED TO
Design, Construction and Maintenance of Highways, Streets, Bridges and Grade Separations

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Copyright 1938, by Gillette Publishing Company.

Acceptance under the Act of June 5, 1934, authorized January 25, 1938, at Chicago, Illinois. Subscription price $3.00 per year in the United States, $4.00 per year for foreign mailing.

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